

COMPUTERWORLD

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Carter Privacy Initiative Introduced in Congress

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — President Carter last week announced a major initiative to increase the protection of personal privacy, a program which includes several legislative proposals and a call for voluntary action by private industry.

The President proposed legislation to safeguard the confidentiality of personal medical records and information collected through federally funded research projects. The White House said the bills would be introduced in both the Senate and the House of Representatives by long-time advocates of increased

personal privacy protection.

In a message to Congress last Monday outlining the privacy package, Carter also promised a bill "to provide privacy protection for insurance, consumer credit and banking records and for electronic funds transfer." Administration officials said the bill will be ready for introduction in Congress within two months.

In addition, the President called on employers to adopt privacy protection measures for their employment and personnel records along the lines recommended by the July 1977 report of the Privacy Protection (Continued on Page 4)

Statistics Foreshadow Employment Crunch For DP Grads by 1985

By Marcy Rosenberg

CW Staff

Despite rosy predictions of unending job opportunities for computer professionals, recent data from the Bureau of Labor Statistics (BLS) and several educators in the field indicates academic institutions may glut the market for computer science graduates as early as 1985.

According to BLS and educational survey data, more individuals are being trained for computer-related careers than the job market will be able

to absorb in the next five to 10 years.

In fact, recent statistics suggest the gap that existed in the '60s between the supply of and demand for professional computer manpower is already beginning to narrow — production of computer-trained professionals, especially by two-year vocational and technical schools, is catching up to industry needs.

Based on the 1976 Current Population Survey conducted with the Bureau of the Census, BLS forecast that by 1985, 290,000 computer programmers will be in the U.S. labor force, an increase of 60,000 from the 230,000 employed in 1976.

And over the same nine-year period, 50,000 more systems analysts will be employed in 1985 (210,000) than in 1976 (160,000).

Taking into account factors such as retirement, deaths and attrition, BLS projected that from 1976 to 1985, average annual openings for computer programmers will total 9,700; for systems analysts, 7,600.

These estimates are substantially (Continued on Page 8)

'Relap' to Restage Nuclear Crisis

By Brad Schultz

CW Staff

BOISE, Idaho — Software simulation by a federal agency here may explain why the Three Mile Island nuclear power plant near Harrisburg, Pa., nearly "melted down" in history's worst reactor accident.

The Idaho National Engineering Laboratory (Inel) hopes to use a Fortran program called Relap in simulating the calamity with Control Data Corp. hardware. When fed a basic description of a proposed or actual nuclear plant, Relap indicates how the plant would or did respond to changes in performance-related parameters.

Packages similar to Relap supported the design of General Public Utilities Co.'s errant atomic plant, which released dangerous radiation into the atmosphere. San Francisco-based EDS Nuclear, Inc. provided at least some of those packages, according to Dr. Ronald J. Baschieri of EDS Nuclear's Project Development Division.

Baschieri declined to say which products were applied to Three Mile Island or whether their integrity is in doubt.

But the software house is prepared for possible litigation in the matter, he told *Computerworld*.

EDS Nuclear does market a modified version of Relap that is available through CDC's Cybernet remote computing service. Known as Relap4/Mod5, the EDS Nuclear package reportedly can demonstrate whether a nuclear facility's safety equipment can

tolerate abnormally harsh conditions, such as the extreme overheating at Three Mile Island.

For example, the package can simulate the increased temperature and pressure that follows a pipe rupture. The Harrisburg situation involved the failure of two water pumps and a valve, preventing the flow of water (Continued on Page 6)

Welfare Matching Hits Snag in Bay State

By Marguerite Zientara

CW Staff

BOSTON — U.S. District Judge W. Arthur Garrity Jr. last week ordered a halt to Massachusetts State Welfare Department interviews of 15,884 welfare recipients who were being investigated for allegedly having unreported income because of a computer cross-check of welfare and Social Security Administration data.

Acting in response to a class action suit filed two weeks ago against Gov. Edward King and other state officials on behalf of the welfare recipients

[CW, April 2], the judge also ordered the department to restore to the welfare rolls about 30 recipients who had "voluntarily" removed themselves from the rolls as a result of the investigation.

The 15,884 names had shown up as a result of a computer cross-check of files containing data 15 to 18 months old, according to a suit filed by the Massachusetts Law Reform Institute and Greater Boston Legal Services (GBLS). Garrity said the Welfare Department was improperly conducting a criminal fraud investigation under the

guise of a civil review to redetermine eligibility of recipients, thereby avoiding the stricter requirements for such a criminal investigation.

The suit claimed that welfare recipients who came under investigation for fraud as a result of the cross-checks were not informed of the nature of the investigation and therefore were not told of their rights concerning self-incrimination.

In addition, the suit claimed, the recipients were asked to supply "excessive verification," such as W-2 forms (Continued on Page 8)

Shortage Eases; Lawsuits Hit Paper Vendors

By Brad Schultz

CW Staff

As paper industry spokesmen began predicting a gradual resolution of the paper shortage that has afflicted large DP users for several months, the legal teams of 15 of the major suppliers prepared to answer price-fixing charges associated with that shortage.

Despite an enormous backlog of orders for the stock used in DP forms, output paper and keypunch cards, "things are back to normal" following the settlement of the West Coast mill strikes last month, one spokesman said.

User suspicions that the shortage was a paper industry ruse to skyrocket profits in the face of unprecedented demand have gained substance in a host of antitrust lawsuits filed by nearly

half the nation's state governments.

The mammoth litigation costs that may ensue as the paper vendors' lack horns with state prosecutors in federal courts could drive up paper prices even more, a spokesman for one of the defendant firms observed.

As part of the strike settlement, the 17,000 members of the Association of Western Pulp & Paper Workers have won 1979, 1980 and 1981 pay hikes of 10%, 9% and 8%, respectively. This added overhead might also be passed on to the consumer, an informed source pointed out.

Most West Coast mills were idle during the negotiations for improved pay and benefits, resulting in a sharp decline in the production of (Continued on Page 4)



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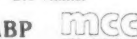
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According to Yourdon 'Structured Revolution' a Failure

By Don Leavitt

CW Staff

CHICAGO — Management was to blame for the general failure of the first "structured revolution" and only management can ensure that the second revolution — now beginning in several DP organizations — will be successful, according to consultant Ed Yourdon.

One of the strongest advocates of the "structured" techniques that have taken shape during the past decade to add order to software development efforts, Yourdon said much of the money, time and effort spent on trying to convert programmers and analysts to the techniques has been wasted.

Many organizations find their people still developing the same "expensive, bug-ridden, slipshod, unmaintainable" software they were developing before structured programming was introduced, he told the 1,000-odd attendees at the 1979 Deltak, Inc. Users Conference here last week.

Before considering how to introduce the structured techniques effectively, managers would benefit by recognizing what went wrong in the first "revolution," Yourdon noted. Many of the organizations involved in the first revolution heard about structured techniques from a hotshot member of their staff who attended a conference sponsored by Guide or the Association for Computing Machinery; such scouts are often so intellectually superior, so brash or so arrogant that they are disregarded by their peers, Yourdon said.

Even in those shops where "struc-

ture" has gained some degree of acceptance, little effort is made to introduce the techniques intelligently, he warned.

An outside "expert" might present a half-day lecture on "everything you're ever likely to need to know about all that structured stuff." The development staff is then told development schedules have been cut in half because the expert said "structure" doubles programming productivity, he continued.

Selling 'Structured'

If those have been the problems, then how can a DP organization introduce structured techniques — or, for that matter, any new technology — successfully? Yourdon asked rhetorically. To a large extent, the answer is to approach it in the same way you would approach a "real" DP project, he said.

Just as a normal project requires distinct activities of analysis, design, implementation and testing, so the introduction of structured development techniques requires the same activities, he explained.

The effort has to start with a dignified selling effort to convince the DP staff the structured techniques are, if nothing else, at least worth investigating. "In most organizations, you have to approach several distinct levels of people to do your selling job," Yourdon told the audience of DP managers and trainees.

Selling top management is a totally different job than selling middle managers or technicians, he noted. The

people at the top aren't involved in the day-to-day chores, so the technical details can be skipped. Concentrate instead on arguments of economics — how maintenance costs will be reduced, for example, he suggested.

Middle management is "where you'll have your most trouble selling the techniques," according to Yourdon. It's easy for the veteran project manager to get the impression that the introduction of structured techniques is an implied criticism of the way he has done his job for the past 15 years.

The manager at this level is also deeply involved in the day-to-day pressures of software development, he added. More to the point, this manager is "plagued by pressures of deadlines. He may agree that the new techniques can reduce maintenance costs — but right now he's faced with a schedule he can just barely meet with his conventional techniques."

The senior technicians — "the grizzled veterans who have been programming since 1952" — will have many of the same reactions as middle management. The moderately experienced ones, on the other hand, will intellectually accept the new techniques, "but their brains are so badly warped by years of terrible programming languages that they'll never really specify, design or code a structured program."

It may well be the trainees that prove "structured's" salvation, Yourdon continued. They can be trained to do it right from the very beginning, he explained.

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Carter Sends His Privacy Initiative to Congress

(Continued from Page 1)

Study Commission. He also urged commercial credit grantors and reporting services to adopt similar measures.

Where voluntary compliance can "sufficiently protect" individual rights, legislation was not being recommended, according to White House spokesmen.

State governments were urged to provide privacy protection for public assistance and social services records and to develop secure state record-keeping systems, particularly criminal justice information systems. Federal agencies are already bound by the Privacy Act of 1974.

'Dangerously Intrusive'

In his message to Congress, Carter noted that with the proliferation of computers and telecommunications systems, "personal information on millions of Americans is being flashed across the nation from computer to computer."

Carter said "modern information systems are essential to our economy... but they can be used to create a dangerously intrusive society."

"It is time to establish a broad, national privacy policy to protect individual rights in the information age," he said. "Our challenge is to provide privacy safeguards that respond to these social changes without disrupting the essential flow of information."

The President said his proposals were founded on recommendations of the Privacy Protection Study Commission and based on two principles:

- Fair information practices. "Standards must be provided for handling sensitive, personal records," Carter said. "Individuals should be told what kind of information is being collected about them, how it will be used and to whom it will be disclosed."

- "They should be able to see and obtain a copy of the records and correct any errors. They should be told the basis for an adverse decision that may be based on personal data. And they

should be able to prevent improper access to the records."

- Limits on the government. "Government access to and use of personal information must be limited and supervised so that power over information cannot be used to threaten our liberties."

Carter noted that the two principles were adopted in last year's Right to Financial Privacy Act [CW, Oct. 23]. Henry Geller, head of the National Telecommunications and Information Administration (NTIA), said that the 1978 law was "a basic model" for the new proposals.

Geller told reporters last Monday that the Administration's package was the culmination of a privacy thrust that produced the 1974 Privacy Act and led to the creation of the Privacy Protection Study Commission. The commission's final report, issued in 1977, called for a government study of ways to implement the commission's recommendations in the private sector. Geller was co-chairman of an interagency task force that performed that study.

David F. Linowes, who was chairman of the commission, praised the Administration's proposals, saying he was "very pleased with how effectively and thoroughly the draft legislation does implement the intent of the Privacy Protection Study Commission."

No New Laws

Geller said Monday that the call for state and voluntary action was based on the President's desire that no new federal regulatory structure be necessitated by the privacy initiatives. Individuals will be able to enforce compliance with privacy laws through court action when organizations fail to comply and will receive damages to compensate for any loss caused by non-compliance, the Administration explained.

White House spokesmen said the Administration's medical and research

privacy bills will be introduced in the House of Representatives by Richardson Preyer (D-N.C.) and Barry Goldwater Jr. (R-Calif.), both of whom had earlier introduced similar legislation.

Geller noted that the House Subcommittee on Government Information and Individual Rights, which Preyer chairs, was scheduled to begin hearings on medical records privacy last Wednesday.

The bills will be co-sponsored in the Senate by Jacob Javits (R-N.Y.) and Abraham Ribicoff (D-Conn.), with

hearings expected to begin some time this summer, according to Rick Neustadt, assistant director of the White House Domestic Policy Staff.

Geller said the "Fair Financial Information Practices Act" will be introduced this spring. A draft of the legislation, circulated earlier to Congress and representatives of industry and public interest groups, has received "substantial support" from all sectors.

NTIA is presently working out the details for implementing what will be a "very complex bill," he said.

Suppliers Hit With Lawsuits As Paper Shortage Abates

(Continued from Page 1)

the stock used in computer input and hard-copy media.

Although the strikes began last July, the paper crunch hit users a few months later, imposing long delivery delays and cuts from orders as severe as 50%. The largest users have apparently suffered the most; a number have rationed paper inventories and are considering alternative media for data storage.

Supplies of raw paper to North America's largest DP forms supplier, Moore Business Forms, Inc., were cut 12% to 15% as a direct result of the strikes, a Moore Business spokesman said [CW, Jan. 15]. During a six-month period, reduced supplies reportedly prevented the firm from delivering 25,000 of the 50,000 rolls of printer paper ordered by Florist Transworld Delivery for \$120,000.

Sherman Act Violation?

State prosecutors intend to show that paper prices have been arbitrarily fixed during recent years in violation of the Sherman Antitrust Act. The paper vendors have attributed the steady ascent of those prices to factors difficult for them to control, such as constraints imposed by environmentalist legislation on tree harvesting.

The suit filed by New Hampshire names as defendants Boise Cascade Corp., Champion International Corp., Crown Zellerbach Corp., Great Northern Nekeosa Corp., Hammermill Paper Co., International Paper Co., Kimberly Clark Corp., Mead Corp., Potlatch Corp., Scott Paper Co., St. Regis Paper Co., Union Camp Corp., Wausau Paper Mills Co., Westvaco Corp. and Weyerhaeuser Co.

The suits filed by other states cite essentially the same defendants and make essentially the same charges. In fact, a number of states have consolidated prosecutions in joint motions filed with the U.S. District Court in Philadelphia.

The other plaintiffs are Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Illinois, Iowa, Kansas, Louisiana, Massachusetts, Minnesota, Missouri, Montana, Nebraska, New Mexico, Oregon, Pennsylvania, South Dakota, Tennessee, Utah and Washington.

New Hampshire has claimed that the defendants have violated the Sherman Act since 1965 by conspiring:

- "To fix, raise, maintain and stabilize the effective sale price of fine paper supplies."

- "To fix, maintain and stabilize the terms and conditions of sale thereof."
- "To divide, allocate and apportion customers."

The manufacturers agreed upon arbitrary paper prices to which each would adhere, New Hampshire asserted. The defendants were also charged with fixing the terms of price "concessions or exceptions."

Further, the defendants allegedly "conspired to and did eliminate independent merchant houses." They also "rigged bids to governmental and non-governmental purchasers," New Hampshire charged.

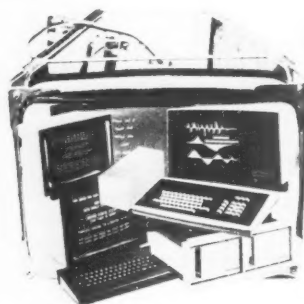
The state also accused the manufacturers with using unspecified threats to force some smaller competitors to abide by the allegedly fixed prices and terms. Those actions allegedly occurred over the telephone or in direct meetings "at hotels, motels and clubs in different locales."

This activity has kept paper prices at "artificial and noncompetitive levels," New Hampshire stated. Moreover, firms that buy raw paper to produce such products as DPs consume "have been deprived of free and open competition."

International Paper — reputed to be the world's largest manufacturer of paper — declined to comment on the antitrust charges. But the firm has proclaimed record profits for the fourth quarter of 1978 — a jump of 27% in three months — while reporting little change in earnings during the entire year.

During the fourth quarter, International Paper's earnings rose to \$81 million compared with \$64 million for the fourth quarter of 1977. Sales jumped 16% to \$1.1 billion, the manufacturer reported.

Yet net income for 1978 was \$234.2 million compared with \$233.7 million for 1977. Last year, the firm reportedly paid \$23.1 million in after-tax charges for settlements of class action antitrust suits.



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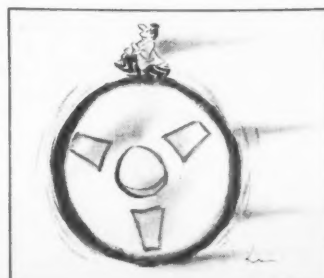
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Involves Regional Processing

DOE Proposes Emergency Gas Rationing Plan

By Marguerite Zientara

CW Staff

WASHINGTON, D.C. — The Department of Energy (DOE) has proposed a contingency plan for gasoline rationing that would be built around "large bank computer centers" for regional processing of gasoline ration checks and coupons.

Now in public hearings, the plan involves distributing gasoline ration coupons to consumers through financial institutions such as banks and savings and loan associations as well as "possible department stores and other centrally located places," according to Bill Webb, spokesman for DOE's Economic Regulatory Administration.

Ration rights would be determined "strictly on an auto registration basis," Webb said. After obtaining a list of registered cars from each state, the DOE would send quarterly "checks" to individual consumers, entitling them to a uniform amount of gasoline per registered vehicle.

The allotment per consumer would vary according to the shortages at the time, Webb explained. The ration checks would be redeemable for coupons at the distribution centers operating under DOE contracts.

Even with rationing, "if you're really desperate for gasoline, you can get it" through a white market pricing situation that would be established competitively, Webb said. "If you have coupons you don't need, you'll be able to sell them to somebody else at the established white market price, now estimated to be about \$1.20 per gallon."

The DOE plan states that the institutions exchanging ration checks for coupons "will be responsible for exercising precaution similar to those used when monetary checks are cashed for currency." These precautions include inspection for validity and proper endorsement and requests for "proper identification from all individuals presenting checks for coupons."

Regional Centers

About 15 regional processing centers (RPC) would do the actual account bookkeeping and computer processing, according to the plan.

These large bank DP centers would maintain computerized account records, post daily deposits and withdrawals, reject and return checks on accounts with insufficient balances, provide bank stationers with names of applicants for ration and redemption accounts and mail blank ration checks and deposit forms.

In addition, the RPCs would print and mail account statements monthly to all account holders.

Only after congressional approval would the RPCs and coupon distribution points be designated, Webb noted. At that point, the plan would go into a "preimplementation" phase.

"Even then, it cannot be implemented until the President says so," Webb added. Furthermore, "the President would then again have to approach Congress to get further approval for actual implementation."

Assuming Congress approves the plan by the end of April, the earliest it could be implemented would be next fall, Webb estimated. The plan will not be implemented, however, unless

something more than 15% shortfall of petroleum supplies hits the U.S., according to a spokesman for the American Bankers Association (ABA) Operations/Automation Division.

"In my opinion, the government would have to spend a considerable sum of money in order to get ready [by next fall]," ABA's Robbie Robinson commented.

Implementation depends on how fast the government can get ready and, "more importantly," Robinson said, there would have to be a "major disruption" of oil supplies coming into this country. Such disruptions could include "another oil embargo, possibly some acts of sabotage against substan-

tially large pipelines or an international confrontation interrupting our shipping of petroleum from the Middle East."

'Wait and See' Stance

Presently, financial institutions seem to be taking a "wait and see" stance before preparing for the proposed plan. "The contingent nature of the plan is such that I really doubt that at this time banks would be gearing up to provide the automated services that some of them will be contracting to provide if rationing does take place," Robinson remarked.

If the plan is implemented, Robinson said, it will be "extremely disruptive."

With only about 40,000 banking offices in the country cashing ration checks for 160 million registered vehicle owners, "there's going to be a mass rush to the bank to cash those checks, and that's going to happen once every quarter."

Other groups are also dissatisfied with the bill. "The independent petroleum retailers are concerned about how the supplies are going to be allocated and the consumer groups are concerned that not everybody entitled to gasoline will be getting gasoline," an observer of the congressional hearings noted.

Congress must act on the plan by the end of April.

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RJE Backup Rushed to Site Near Nuclear Plant

READING, Pa. — One of the more critical jobs during the incident at the Three Mile Island nuclear power plant near here was monitoring and recording radiation exposure levels of the people who had to go in and out of the plant.

Quick action in replacing a remote job entry (RJE) system on the plant grounds allowed that work to proceed after the system was declared inaccessible. Officials of both the General Public Utility Co. (GPU) DP center here and Data 100 Corp., which supplied the equipment, worked around the clock to make sure that radiation monitoring could proceed.

A Data 100 Model 78 RJE system consisting of a card reader, magnetic and paper tape units, a CRT, a processor and a printer was located in an office building on the grounds of the nuclear plant. The system is one of four Data 100 RJE terminals out of 15 linked to GPU's 12M-byte IBM 370/168 multiprocessor here.

Radiation Monitored

One of the important jobs of the Data 100 system at Three Mile Island was processing the Radiation Exposure Monitor (REM) application, which records data on the amount of radiation to which plant workers are exposed.

Workers wear badges which reflect cumulative radiation exposure. These are processed through a badge reader and converted to paper tape, which serves as input to the REM application.

Computer routines associated with that application maintain detailed histories of all plant workers so that health physics personnel can determine current and long-term radiation doses to workers at the site.

When the plant ran into trouble on Wednesday, March 28, the Data 100 system on the site was powered down and decreed off limits until an accurate assessment of the situation could be made. Compilation of exposure data continued during the period immedi-

ately following the accident, but automated processing of the REM system was temporarily interrupted.

DP management representatives from GPU, after being advised that the Data 100 system would be unavailable for some time, held an emergency meeting late the following Friday night to review the situation. They decided a backup system was necessary to resume processing.

Saturday morning the local field office of Data 100 was asked to provide a

system, and the firm promised to do whatever was necessary. Working all day, Giuseppe Policani, regional manager for field engineering, Dick Ruhland, field engineering district manager, Carl Lingesso, regional marketing manager, John Pouoy, marketing representative, and Bob Ciccirelli, regional systems engineering manager, together packed up a demonstration system at the firm's Cherry Hill, N.J., office.

By 3 p.m., it was loaded on a truck

and on the way. The system was delivered to the site that evening.

GPU officials at the site worked through Saturday night, equipping a trailer with associated electronics, air conditioning and teleprocessing gear to house the spare system.

By 8 a.m., Stu Horton and Ralph Showalter, Data 100 field engineers, began installing the system. It was up and running by noon on Sunday and has been used to process the radiation exposure data throughout the week.

Nuclear Crisis' Simulation Rests on 'Relap'

(Continued from Page 1)

needed to cool the reactor's core [CW, April 2].

When the water flow to the Three Mile Island reactor core was interrupted at about 4 a.m. on March 28, the reactor should have automatically shut down in a procedure known as "scramming." Instead, for reasons Inel may discover, the reactor did not scram for up to a minute after the flow stopped.

Overheating resulted, damaging many uranium rods in the core and almost inducing an uncontrollable meltdown.

'Relap' Modification

EDS Nuclear once detected a bug in Relap that would have caused the improper monitoring of water packing at a reactor plant. This bug was hurriedly resolved because its discovery was delaying one plant's construction, according to a CDC spokesman.

EDS Nuclear and CDC jointly developed a Relap modification said to feature a "postprocessor" that compiles dynamic fluid-forcing functions on the basis of reactor water conditions. These functions are called by other EDS Nuclear programs to analyze pipe status in a reactor.

One of these programs, Superpipe, is said to meet requirements of the Nuclear Regulatory Commission (NRC),

American National Standards Institute and American Society of Mechanical Engineers. Superpipe is intended to support stress analysis and efforts to optimize plant design.

EDS Nuclear reportedly audited CDC's software quality assurance program before marketing any products that involved CDC-originated code. The remotely accessed packages run on CDC 7600 and Cyber 175 CPUs.

Simulation Postponements

Within days of the Three Mile Island overheating, the NRC asked Inel to run Relap simulations of that predicament, according to Larry Leach, manager of the agency's Loss of Fluid Test (Loft) Experimental Program Division.

But the simulations were abruptly called off, rescheduled and called off

again as the parameters describing the facility changed.

Inel wrote the original version of Relap and a number of subsequent revisions, Leach said. The latest release is Relap Model 6, which federal agencies may obtain from the Argonne National Laboratory for the cost of copying the code.

At press time, Inel was on standby alert, waiting for new parameters to feed Relap, which runs at the Department of Energy agency on CDC 7600 and Cyber 173 CPUs.

In northern California, Lawrence Livermore Laboratory is tracking the spread of radioactive gas still leaking at Three Mile Island. A Lawrence spokesman said computer systems support this monitoring, but he declined to identify them.

Greatly Exaggerated

By Jeffrey Beeler

CW West Coast Bureau

BROOKINGS, S.D. — Like the notice of Mark Twain's death, recent reports of computerized grade tampering at South Dakota State University (SDSU) seem to have been greatly exaggerated.

SDSU's computer center director Paul Koepsell last week disputed published accounts that "several" of

the school's 6,500 students altered their grades by gaining unauthorized access to the campus' IBM 370/148.

"We don't have and never have had any indication that anything like that has ever been done," Koepsell said in response to the reports of grade tampering, which first appeared in SDSU's student newspaper, *The Collegian*, and was later carried by United Press International.

The Collegian's editor, however, defended the story and asserted, "We stand behind it 100%." But when asked to cite facts supporting his newspaper's allegations, the student editor referred only to campus "rumors," "circumstantial evidence," and the notes of the story's author.

Although Koepsell did not entirely discount the possibility that students here had secretly revised their grades by computer, he expressed serious reservations that such a scheme had already materialized.

The computer center director supported his contention by noting that the school does almost all its grade processing in a batch mode. "Of all the data we process, grades are the least likely thing that someone could interfere with from a terminal," Koepsell explained.

Moreover, he added, the university has equipped its 2M-byte processor with audit trails and other "substantial" security safeguards that discourage, if not entirely thwart, attempts to tap its computerized data base without authorization.

Koepsell traced SDSU's grade-changing controversy to an alleged misunderstanding that arose during an interview granted recently to one of the student newspaper's reporters.

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MIT Professor Says: Humans in Charge When Atomic Reactor Fails

By Brad Schultz
CW Staff

CAMBRIDGE, Mass. — When the Three Mile Island nuclear power plant began failing, humans — not systems — had ultimate control of the plant's basic functions.

Like virtually all nuclear power plants, the General Public Utilities Co. facility near Harrisburg, Pa., used computer systems to support human decision making or sound alarms in emergencies. But CPUs could not have adjusted the reactor to handle drastic overheating without human supervision, according to Prof. David D. Lanning of MIT's Nuclear Engineering Department.

The Three Mile Island situation — which involved the release of dangerous radiation into the atmosphere — probably involved human errors, Lanning said. However, machine or software failures may well have compounded those errors.

The Nuclear Regulatory Commission (NRC) doubts that present computer technology is reliable enough to deserve full control of reactor operations in emergencies, Lanning explained. Nuclear power plants cannot be established in the U.S. without NRC approval.

That skepticism is justified as long as CPUs in use at atomic plants do not feature at least triple redundancy of hardware and other properties of so-called "fault-tolerant" systems, Lanning declared.

The National Aeronautics and Space Administration relies on fault-tolerant systems to support manned spaceflights, he noted. Vital components in these systems are arranged in parallel so that if some components fail, data is automatically rerouted to working, functionally equivalent circuits.

If necessary, nonvital circuit activity may then cease, allowing a concentration of resources on support for vital functions, Lanning added.

Automatic Atoms?

The development of fault-tolerant systems for nuclear power plants is the ultimate goal of research currently led by Lanning and Dr. Paul Nicholson of Cambridge-based Charles Stark Draper Laboratory, Inc. If such technology can be perfected, nuclear plants — where reactor-generated steam drives turbines to produce electricity — may be automated to a far greater extent than currently allowed.

The next generation of nuclear plants may thus require far fewer humans to provide technical support, Lanning observed.

At present, typical nuclear plants primarily use computer systems to support reactor "surveillance," he said. This entails precision monitoring of reactor activity — collecting data on core temperature and the displacement of uranium or controlling cobalt rods, for example — and comparison of these values to prescribed safety margins.

Plant terminal operators or other technicians regularly inspect printouts of this data, Lanning continued. In some facilities, the CPU might automatically ring alarm bells in the event unsafe conditions — such as excessive reactor heat or an insufficient flow of

cooling water — were detected.

The CPU is not generally allowed to directly control mechanical equipment without human supervision, Lanning noted. Hence, computer systems at typical nuclear plants could not — acting independently — push in or pull out control rods nor open or shut water valves.

At atomic plants, DP equipment operators are usually not experts in computer technology, he continued. An entire CPU behind a control panel commonly supports the operator with natural language query capabilities; a CRT might display the status of various subsystems or provide data base accessibility.

But many plants do maintain a staff of systems-level programmers to modify the software supporting the CPU. Some plants rely on systems vendors for services, Lanning added.

The extent of automation varies from plant to plant and also from country to country, the professor observed. Japanese nuclear facilities reportedly make fuller use of graphics processors than U.S. facilities.

Software Simulation

A number of universities, research institutions and private firms are developing software to simulate proposed and actual nuclear plants.

For example, MIT has developed —

under funding from the Electric Power Research Institute — an enormous Fortran program that depicts, on three-dimensional CRT displays, the status of a reactor core subjected to various changes in temperature, pressure and flow of cooling water where that water is recycled.

Lanning is directing a study of how the MIT program can adapt to a variety of input parameters. Other researchers are attempting to streamline the code and have compared execution times of various modules on MIT's IBM 370/168, Control Data Corp. 7600 and Honeywell, Inc. Multics mainframes with benchmarks for similar software developed elsewhere.

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Grads Could Glut Market Statistics Foreshadow DP Job Shortage by '85

(Continued from Page 1)

lower than earlier BLS projections of average annual openings from 1968 to 1980 — 23,000 a year for programmers and 27,000 a year for systems analysts.

Compare BLS demand estimates to the number of students preparing for careers in the computer field. One indication of the rate of production of computer-trained professionals can be gleaned from a survey, "The American Freshman: National Norms for Fall 1978," conducted jointly by the University of California at Los Angeles (UCLA) and the American Council for Education.

Researchers asked 2,668 institutions of higher education to participate in the survey. This was the number of institutions — containing at least 30 freshman students — listed in the 1977 annual U.S. Office of Education "Education Directory."

Schools that declined to participate or that didn't return survey forms in time to include their data reduced the sample to 383 — including two- and four-year, public and private colleges and universities.

Results of the survey showed that of approximately 822,213 first-time, full-time 1978 entering freshman men, 4% — or 32,888 — named "computer programmer or analyst" as their probable career. Similarly, 3% of approximately 859,204 entering freshman women, or 25,776 of these students, identified the same career path.

The survey's total of 58,664 (25,776 plus 32,888) 1978 freshmen who plan to become computer programmers or analysts is about 3.4 times the estimated yearly demand for these professionals — the 17,300 (9,700 plus 7,600) projected by BLS.

While the UCLA survey data did not take into account dropouts, transfers or changes of major, the same population of 383 schools amounted to only 14% of the desired population of 2,668, and the survey did not examine sophomore, junior and senior classes.

One of the few researchers who has attempted to provide supply and de-

mand estimates for computer professionals at all degree levels is Dr. John W. Hamblen, chairman and professor of the Computer Science Department at the University of Missouri at Rolla.

In the third (1979) edition of his survey entitled "Information Systems Consultants: Computer Manpower — Supply and Demand by States," Hamblen created his own models for extrapolating to 1977 previously reported statistics on computer manpower demand resulting from growth and replacement and statistics on rates of production by academic institutions of computer-trained professionals.

His demand data includes the following job categories: management positions; systems analysts; systems and applications programmers; and operating personnel.

Hamblen's data shows that in 1977 there were 26,376 computer-related job openings for an estimated 27,273 two-year degree holders; 54,351 openings for 9,509 four-year graduates; 34,153 openings for 3,161 master's degree holders; and 1,309 new openings for 345 Ph.D.s.

Hamblen concluded that "we are producing enough two-year/post-secondary graduates in the computer field, but only one-fourth of the needed Ph.D. holders, one-sixth the needed bachelor degree holders and one-eleventh the needed master's degree holders."

Educators' Consensus

Other educators agree that graduates of two-year programs in the computer field may face a saturated job market.

"The supply of two-year people already exceeds demand," according to Dr. Bruce Gilchrist, director of computing activities at Columbia University.

Many private two-year DP schools that produced great numbers of graduates in the late '60s went out of business in the '70s because many of their graduates couldn't get jobs, he noted.

While Gilchrist doesn't foresee a saturation in the computer job market for

B.A. degree holders for at least five years, he did note there was a tenfold increase from 1967-1977 in the number of students who graduated from four-year degree programs with computer science majors and minors.

"At some point, we will saturate the market," he said. "An increasing number of noncomputer science B.A. graduates will be competing with computer science majors for jobs."

Depending on their applications, some employers prefer to hire economics or business majors with computer backgrounds over bona fide computer science majors or graduates of two-year programs who tend to lack general educational or business backgrounds, he added.

"Caution is called for, not panic," Gilchrist maintained. "We now realize programmers are not taking over the world and the growth rate in the job market is manageable, though appreciable."

He cautioned, however, that schools could swamp the market. And even if the number of job offers begins to slacken, "academic institutions take a while to turn off programs as long as there are students to fill them" because of the investment in faculty and facilities.

No Easy Ticket

Going the next step, Dr. Robert J. Buff, professor and director of the computing center at East Stroudsburg (Pa.) State College, fears "we are misleading kids into thinking they can write their own ticket for jobs in the computer field."

Buff believes the number of students studying for computer-related careers will "far exceed the demand for entry-level positions." What's taking place in the computer industry "is a continuation of the trend to get the end user in closer proximity with the computer and remove the middlemen — the pro-

grammer and systems analyst."

A growing acceptance of purchasing software, increasing demand for turnkey systems by small businesses and the migration of computers into the home are just several indications of this trend, Buff maintained.

More end users are buying software to save time and money, he said. With the availability of software that can be transferred from one piece of hardware to another, "the cost of reinventing the wheel has become so darn expensive compared to what you can purchase."

Further, turnkey systems provide users with preprogrammed hardware/software packages "that are less costly than clerical employees in many cases."

BLS Agrees

BLS also noted these factors in presenting its most recent occupational outlook for computer professions. In its 1978-79 "Occupational Outlook Handbook," BLS pointed out that employment opportunities for applications programmers will not grow as rapidly as in past years for several reasons:

- Utility programs that can be used by people other than DP personnel will "simplify or eliminate some programming tasks."

- Technology has reduced the size and cost of computer hardware, bringing computer systems within reach of more small businesses that will install their own computer rather than rely on an outside DP firm.

All things considered, the job market bears watching for students at the four-year and graduate levels. As Gilchrist put it, "We have to avoid the situation that evolved in physics and engineering — attracting too many people into the field and running out of jobs."

Mass. Matching Hits Snag

(Continued from Page 1)

and income tax forms. The welfare recipients were notified that failure to bring such documentation could result in the termination of their benefits, the suit claimed.

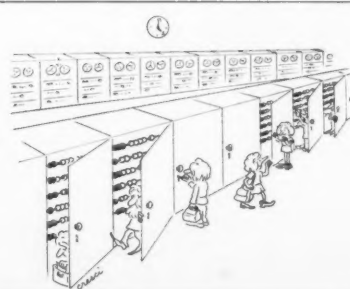
In ordering the restoration of the estimated 30 recipients who had "voluntarily" removed themselves from the rolls, Garrity said the department can determine their eligibility through "usual procedures . . . but not on the basis of intimidating people to produce records they may or may not have."

Garrity noted that regulations of the department's Bureau of Welfare Audit-

ing guarantee the subjects of a fraud investigation with such rights as 10 days' notice of the interview, a notice of the interview's purpose and a chance to postpone the session.

"We are overjoyed [with the decision]," GBLS attorney Deborah McCutcheon said. "The burden on our office was incredibly intense. There was no way we could handle the volume of terrified people that were coming in."

"They really had nothing to fear, but it was impossible to ascertain that until you'd sat down and done an hour-long interview with each one."



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Linda and Brian: Logged On for Life

By Jay Woodruff

CW Staff

LAS VEGAS — A combination of computers and flowers brought a couple to the altar here recently, and although the bride said the wedding was a "little hectic," the two-part ceremony went off without a bit of trouble — or a single disconnect.

The bride, Linda Crider, is a customer service representative for Florafax International, a wholesaler based in Tulsa, Okla., that transmits flower orders nationwide. The groom, Brian Barber, is a florist here.

Crider and Barber met via CRT. Barber, who had been having trouble with the Florafax system, struck up an electronic conversation with Crider in an effort to solve it.

"Each time he'd call, we'd discuss a little bit more," Crider said. Two months later — although they still had not met face-to-face — they were engaged.

Following the traditional ceremony here recently, the couple repeated their vows — this time keyed from a terminal at Barber's flower shop to another terminal operated by Rev. Mercer McKinney, a Universal Life Church minister.

Mercer was a natural choice. He has not only performed marriages on a diving board, in a helicopter nearly 10,000 feet off the ground and on a rooftop, but also runs a florist shop connected to the Florafax system. Mercer's shop is in Oak Grove, Ky., about 1,800 miles away.

Those interested in the advantages of DP may note that while the church ceremony took about 30 minutes, the computer ceremony took only 25 minutes. The bride and groom honeymooned in San Francisco.

Robert Barton Slated for Award

PHILADELPHIA — Robert S. Barton of Burroughs Corp. is to be the first recipient of a newly established award in honor of Doctors J. Presper Eckert and John W. Mauchly, co-inventors of the first electronic computer.

The award, which will be presented by Eckert and Mauchly at the Sixth International Symposium on Computer Architecture, is for contributions to computer and digital systems architecture.

On hand for the presentation will be the presidents of the award's two co-sponsoring organizations, Daniel McCracken of the Association for Computing Machinery (ACM) and Tse Feng of the IEEE Computer Society.

The symposium, to be held April 23-25, will feature Richard L. Gehring, president of Univac, as keynote speaker, as well as a tutorial session on "Data Base Computers" and two days of technical presentations on computer architecture.

For ACM or IEEE members, conference registration costs \$85, with the tutorial costing \$40. For nonmembers, conference registration costs \$95 and the tutorial \$50.

More information is available from Rosalie Ashenfelter, Univac, P.O. Box 500, Mail Station A2L, Blue Bell, Pa. 19424.



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ACM Proposes Computer Science Curriculum

By a CW Staff Writer
NEW YORK — For the first time since 1968, an undergraduate computer science curriculum has been proposed by the Association for Computing Machinery (ACM).

Eight courses make up the curriculum core:

- Computer Programming I (CS1).
- Computer Programming II (CS2).
- Introduction to Computer Systems (CS3).
- Introduction to Computer Organization (CS4).
- Introduction to File Processing (CS5).
- Operating Systems and Computer Architecture I (CS6).
- Data Structures and Algorithm Analysis (CS7).

- Organization of Programming Languages (CS8).

CS1 would be the prerequisite for CS2, which would be the prerequisite for CS3, CS4, CS5 and CS8, according to the plan submitted by ACM's Curriculum Committee on Computer Science.

The prerequisite for CS6 would be both CS3 and CS4, while CS5 would be the prerequisite for CS7. In addition, CS3 and CS5 would be "highly recommended" as the CS6 prerequisite.

"The elementary core material represents subject matter necessary for all students in computer science in order to achieve the objectives of the undergraduate major," the committee said in last month's *Communications of the*

ACM. "The intermediate level core material follows naturally by providing the students who have been equipped with the basics of the field with the tools to be operational computer scientists."

The committee also recommended that computer science majors be trained to:

- "Write programs in a reasonable amount of time that work correctly, are well documented and are readable."
- "Determine whether they have written a reasonably efficient and well-organized program."
- "Know what general types of problems are amenable to computer solution and the various tools necessary for solving such problems."
- "Assess the implications of work

performed either as an individual or as a member of a team."

- "Understand basic computer architectures."

- "Be prepared to pursue in-depth training in one or more application areas or further education in computer science."

Programming Skills

Computer science majors should be thoroughly grounded in the implementation of algorithms in programming languages that "operate on data structures in the environment of hardware," the committee advised.

The proposal specified topics to be addressed in programming courses. For example, an algorithms course should cover the nature and properties of algorithms, how they apply to problem-solving and how they can be expressed in programming languages.

Topics "common to all undergraduate programs in computer science" in the area of programming should include, besides algorithms, programming languages, programming style, debugging and verification and applications, the committee continued. In the area of software organization, topics should include computer structure and machine language; data representation, symbolic coding and assembly systems; addressing techniques; macros; program segmentation and linkage; linkers and loaders; and systems and utility programs.

Finally, in the area of data structures and file processing, courses should handle data structures, sorting and searching, trees, file terminology, sequential access, random access and file I/O.

The committee advocated the assignment of programming projects to undergraduates. While calling for an emphasis on techniques of structured programming, the committee said a specific course on structured programming "is not intended at the elementary level."

Advanced Electives

Ten "advanced-level" elective courses were also suggested:

- Computers and Society (CS9).
- Operating Systems and Computer Architecture (CS10).
- Data Base Management Systems Design (CS12).
- Artificial Intelligence (CS11).
- Algorithms (CS13).
- Software Design and Development (CS14).
- Theory of Programming Languages (CS15).
- Automata, Computability and Formal Languages (CS16).
- Numerical Mathematics: Analysis (CS17).
- Numerical Mathematics: Linear Algebra (CS18).

The committee also called for the following set of mathematics courses as baccalaureate requirements for a computer science major: introductory calculus, mathematical analysis I, probability, linear algebra, discrete structures, mathematical analysis II and probability and statistics.

"An understanding of and the capability to use a number of mathematical concepts and techniques are vitally important for a computer scientist," the *Communications* article stated.

The committee also proscribed computer science courses for nonmajors.

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Six-Month-Old Errors Still Uncorrected Program Changes Foul Up Postal Workers' Pay

By Ann Dooley

CW Staff

BOSTON — Recent programming changes in the U.S. Postal Service's (USPS) payroll system reportedly are causing thousands of paycheck foul-ups, including the issuance of some incorrect pay amounts that date back six months and remain uncorrected.

The bulk of the problem began last July, when the USPS data center redesigned its payroll system in accordance with the newly enacted Fair Labor Standards Act. Under the law, information that had been calculated on a biweekly basis has to be calculated weekly, even though employees are still paid every other week.

More extensive information is collected and compiled under the new system, including how much an employee has paid into his retirement fund each week and how much hourly pay he earns each week, calculated to the minute.

'A Damned Mess'

"Things haven't been right since the system began," according to Anthony Ragucci, president of Local 301 of Mail Handlers Union of New England. Ragucci estimated that 3,500 to as many as 6,000 adjustments have been made in the New England area alone.

Postal officials told Ragucci a certain number of bugs have to be worked out, but the union leader believes that more than enough time has been allowed to correct any problems.

Under the new system, pay raises, for instance, sometimes don't show up on an employee's paycheck until months later; the same goes for overtime and sick leave.

One employee was recently notified by the Postal Service that he was dead and his "terminal" pay was included with the notification. After informing the USPS that he wasn't deceased, he received a letter telling him he had just been promoted.

"The whole system is a damned mess," Ragucci commented. "And it doesn't seem to be getting any better."

Massive Undertaking

Although postal officials admitted having had problems in the conversion process, they said conditions are improving for employees in all parts of the country. The error rate has dropped dramatically in the last few months, according to a USPS spokeswoman. Most of the errors are common to any start-up operations, she said.

This is probably the largest system of its kind, and any such changeover is a massive undertaking, the spokeswoman observed. The system handles the

payrolls of 650,000 people in more than 50,000 locations.

The work is done on two IBM 370/158 systems and an Amdahl Corp. 470V/7 which operate in different sections of the country and are used to process payroll information from the branches, she explained.

Even with all the system changes, less than 75% of the national biweekly payroll has been affected, another spokesman continued. Ragucci, on the other hand, contended that 5% to 6% of his union members were experiencing problems with their paychecks.

Everyone must understand that although a tremendous change is taking place, the error rate has been improv-

ing all the time, the Postal spokeswoman stated. Incorrect data is sometimes input from the field and therefore some errors are inevitable.

Top management at the Postal Service has not underestimated the extent of the problem, she said, noting that 200 additional employees were hired and 1330 other employees were transferred from other departments to keep up with all the new data being input and computed. Everyone believes that the worst is over, however, she added.

Many stumbling blocks remain. New problems keep appearing in the system; one problem in an employee file is corrected and something crops up somewhere else, the spokeswoman

said.

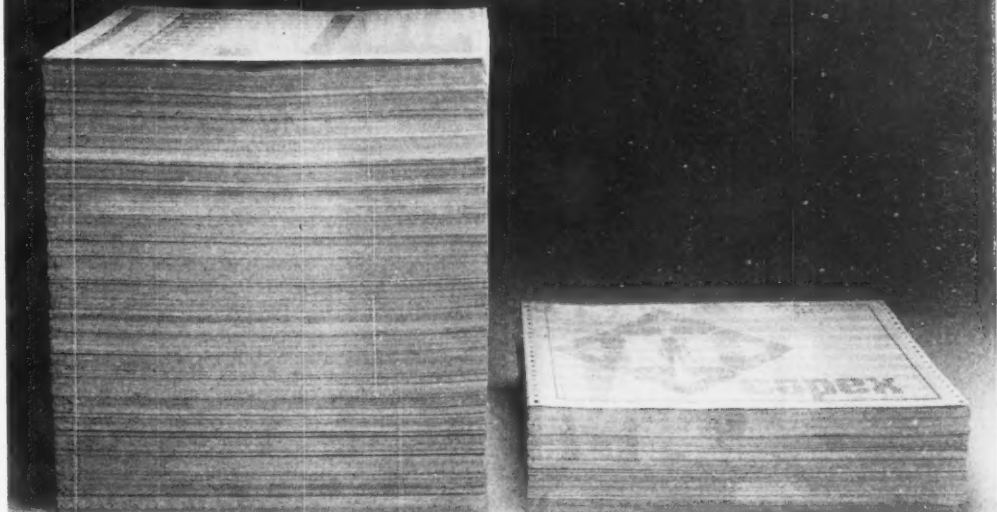
Seconding this, Ragucci pointed out that it isn't enough to correct one employee's problem. "We need to get the whole system corrected," he said.

A real morale problem has developed, according to the union leader: "An employer can't keep shortchanging someone month after month without creating problems." The union may be forced to look into some kind of action such as a work stoppage if too many employees are affected, he warned.

Most of the employees don't really care about all that extra information anyway, he claimed, adding that "they'd rather get their correct pay every week than the extra information."

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	Intended	Unintended
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Detective Investigative Support (record searching)	Operational performance not improved by local automation	Positive work environment
Patrol Officer Support (record searching)	Improved operational performance	Positive work environment
Police Manpower Allocation (sophisticated analytics)	Neither decision-making nor operational performance improved	Positive work environment Bureaucratic power shifts
Budget Control (process control/printing)	Greater administrative control	Better decision-making Improved operational performance Positive work environment Bureaucratic power shifts
Policy Analysis (record restructuring)	Better decision-making	Positive work environment Bureaucratic power shifts

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Intended and Unintended Performance Outcomes of Automation by Task

Last in Series on City DP Wraps Up Urbis' Findings

This is the final installment of *Computerworld's* series on city DP, the overall summary and conclusions of the two-year study by the Urban Information Systems (Urbis) Research Group.

Urbis was established in 1974 by the University of California at Irvine's Public Policy Research Organization (PPRO) — under National Science Foundation funding — to assess the impact of computing on U.S. local governments.

In the chart shown above, Urbis notes both intended and unintended performance outcomes of six different automated tasks in the 42 cities investigated. Despite clear successes in some applications, Urbis found that

many U.S. mayors and city managers are disappointed by the results of computing [CW, Jan. 29].

Moreover, DP has caused important shifts in political relationships [CW, Feb. 12, March 5].

PPRO has announced that the Columbia University Press will publish the Urbis report, tentatively entitled *The Management of Information Systems: Implementation Policy for Computing in American Local Government*, as a book by the end of this year.

Vicki Raeburn, associate executive editor, can provide more information. She is at Columbia University Press, 562 W. 113th St., New York, N.Y. 10025.

Aeds Computer Fair Set

DETROIT — "Renaissance Man — The Key Component" will be the theme of the Association for Educational Data Systems (Aeds) 17th annual convention to be held at the Plaza Hotel here May 15-18.

Co-hosted by a variety of Michigan educational and DP organizations as well as the Ontario Association for School Business Officials, the conference will offer exhibits, user group meetings, vendor sessions and a computer fair competition.

The theme of the computer fair, to take place May 15-17, will be "The Use of Microprocessors in Education." Applications in such areas as home personal computing projects, student projects, school district applications and teacher-developed computer-assisted instruction programs will be

judged on the basis of hardware and software coordination, originality, creativity and relevance.

Three entries will be chosen to compete at the National Computer Conference.

The deadline for submitting applications for the Aeds Education Computer Fair is April 15.

The Aeds yearly membership fee is \$25 (escalating to \$30 July 1); members can attend the entire conference for \$80.

Nonmembers can attend for an "a la carte" price of \$12/day; a copy of the proceedings is \$10; each banquet meal is \$16; the luncheon is \$12, for a total of \$102.

Aeds is at 1201 16th St., N.W., Washington, D.C. 20036.

Urbis: City DP Too Critical for DP Experts

By Brad Schultz
CW Staff

IRVINE, Calif. — City computing is too important to be run by technical experts.

The ultimate responsibility for municipal DP should rest with the mayor or city manager and department chiefs, according to the Public Policy Research Organization's Urban Information Systems (Urbis) Research Group, which has studied the impact of DP management policies on 42 U.S. cities during the past two years.

"When large expenditures for computer equipment produce few tangible [benefits], top management is responsible. When the information practices of the government bureaucracy appear 'out of control,' top management is responsible," the report said.

When officials shirk responsibility for DP decision making, a "technocratic elite" composed of planners, management analysts and other technical professionals emerges, Urbis stated [CW, March 5]. The so-called technocrats acquire considerable power because they determine what goes into municipal data banks, who can access that data and how it may be interpreted.

Unlike elected and appointed top officials, the technocrats are not regularly reviewed by the city council, citizens groups or the press, the research group noted.

Insatiable Appetite

The report advised that priority-setting not be left to the computer experts, since their attention is focused on technical feasibility and on the maintenance and enhancement of the DP function. "Nor should these priorities be left only to the department users for computing resources are scarce, while the appetite of users for computer applications can be insatiable."

If officials allow city automation to proceed without regard to its social context, local governments will become less responsive to the public's needs. Systems might then be used to entrench the technocratic elite at the expense of civil liberties, Urbis warned.

Turning its attention to system implementation, the report said that once city officials have established priorities and designated which operations or administrative units are to be automated, they should chart the course of implementation. The degree and pace of computerization should be carefully planned to allow for organizational impact within the city government as well as on the public, surrounding communities and associated jurisdictions (county, state and federal).

The Urbis review of 42 cities indicated that computing usually proves more satisfactory where the technology is more advanced. If a city decides that automation is worth the anticipated monetary costs and social and organizational effects, Urbis advised that city to:

- Automate early and rapidly.
- Automate extensively, rather than partially, to avoid leaving manual bottlenecks.
- Develop sophisticated applications with on-line inquiry capabilities.
- Recruit experienced, sophisticated DP personnel.

- Obtain sophisticated hardware.
- Develop applications to serve multiple decision uses by multiple local officials.
- Develop the ability to produce many computerized reports for particular officials.

Reasons for Suggestions

Early automation gives city personnel more time to adjust to changes in procedures and work styles. Moreover, "the longer an application has been around, the more likely it is to have the 'bugs' worked out of it and to be commonly used," Urbis said.

"On-line processing provides easier access to more up-to-date information and improved performance for nearly every kind of information processing

task."

To appropriately staff DP operations, cities may find they will need to adjust DP salaries to private sector offerings for equivalent positions, the research team observed.

"Automated files can serve management, planning and political uses by a variety of analysts (urban planners, management analysts and budget analysts) and decision makers (mayor, council, city manager and department heads) as well as serve more immediate operational needs. . . Multiple reports, tailored to the decision needs of particular officials, have more utility than a single general-purpose report," Urbis pointed out.

The report noted the difference be-

tween automating routine tasks, such as traffic ticket processing, and non-routine tasks, such as detective investigative support [CW, Feb. 12]. The former are characterized by standard operating procedures, repetition, large processing volumes and consistent purposes over time. The latter feature flexible operating procedures, many different and small-volume operations and frequently changing purposes.

A city facing the automation of routine tasks should centralize computing operations and limit user involvement in design decisions, Urbis advised. Otherwise, development may be impeded by those opposed to change. Such people are concentrated in highly routinized positions and are more likely to resent reorganization.

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FCC to Probe Privacy in Telecommunications

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — The Federal Communications Commission (FCC) will soon begin an investigation into privacy and security in telecommunications, FCC Common Carrier Bureau Chief Larry F. Darby said recently.

Darby told a March 27 meeting of the Electronic Funds Transfer Association that the commission will initiate a formal proceeding to look into ways to protect "the consumers' fundamental right to privacy."

Public controversy over unsolicited telephone calls and eavesdropping and basic national security concerns prompted the FCC inquiry, he said.

Exact details and a timetable for the

investigation have not been worked out, but Darby said the proceeding will be initiated through a formal solicitation of public comments on the subject.

DP Trade Balance Up 22.3% Last Year

The 1978 favorable balance of trade for computers and office equipment was up 22.3% over 1977, according to statistics released recently by the Computer and Business Equipment Manu-

facturers Association (CBEMA).

The statistics, based on Department of Commerce data, show a \$2.873 billion favorable trade balance for the industry, an increase of more than \$500 million over 1977. Although the first quarter of 1978 showed only a moderate increase of 5.5% over the previous year, the final quarter hit a four-year high of 38% over 1977, CBEMA noted.

Total exports were up from \$3.9 billion to \$5.1 billion, while imports rose from \$1.6 billion to \$2.27 billion in 1978. About 25% of the increase in ex-

ports was attributed to an increase in sales of computers and related equipment, the association said.

The total increase in imports of computers and related equipment in 1978 over 1977 was \$303.9 million.

Deregulation Asked Of Earth Stations

The National Telecommunications and Information Administration (NTIA) has asked the Federal Communications Commission (FCC) to deregulate domestic receive-only satellite earth stations.

In comments filed March 23, NTIA told the FCC that the licensing requirement procedure is costly and time-consuming. The result is "unnecessary harm to potential earth station users, earth station manufacturers and the public and an overall dampening of the growth of a vital new communications technology."

The agency complained that although the earth stations typically cost \$1,200 to \$1,400, such things as the interference analysis, administrative expenses and on-site checks required in the licensing procedure can raise the cost up to \$5,000 per unit. In addition, the licensing process often takes as long as a year, especially when the applicant's system encompasses many earth stations.

NTIA contended the licensing process is not necessary as a protective device against interference where the stations are in the path of land-based microwave transmissions. Such techniques as "artificial site shielding" can reduce the danger of interference, the agency noted.

NTIA recommended that instead of the licensing procedure, the FCC require all earth station owners to notify the commission of the exact location of the antennae before beginning operations, giving exact coordinates and specifying intended use.

USGS Launches Study To Meet Water Needs

The Department of Interior's U.S. Geological Survey (USGS) has begun a program to develop computer models of the major regional ground water systems throughout the country to help meet future U.S. water needs.

According to USGS hydrologists, the program will provide a better understanding of existing groundwater flow systems and water quality changes on a regional scale. It will also provide a capability to predict the hydrological consequences of expected groundwater development, Interior said.

Studies are now under way of the aquifers (underground water-bearing rock units) that can be found in parts of 21 states. USGS will develop a computer model for the overall aquifer system of various regions, supported by more detailed simulations of local problem areas.

The models will help provide an understanding of the natural systems and of the changes caused by human activities. "They will also provide a means of predicting the areal affects of present and future stresses, such as increases in pumping, artificial recharge or waste disposal," an Interior spokesman said.

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'New Directions' Theme Interface '79 Starting Today in the Windy City

CHICAGO — "New Directions in Data Communications and Distributed Data Processing" is the theme of this year's Interface '79, which starts here today. The seventh annual conference on data communications and controllers is expected to attract as many as 15,000 people, according to its organizers.

The exposition and conference is billed as an opportunity to learn where data communications and distributed

data processing (DDP) technology stand today and where they are likely to go in the future.

Seventy conference sessions arranged under 18 subject categories will be offered over the four days. The Datacomm School, a series of four sessions lasting six hours, was designed to lead new and prospective users through the

basics of data communications.

Highlights from the conference session topics include:

- "Terminal Trends," a discussion of the way microprocessor intelligence blurs previous distinctions between "smart" and "dumb" terminals and between terminals and processing units.
- "Services Scene," an evaluation of current service offerings, alternatives to common carrier services and network management services.
- "Distributed Data Processing Perspectives," an attempt to determine whether DDP is worth having. The session also examines the current progress of DDP, its outlook for the future and management attitudes toward implementing it.

menting it.

Exhibits on the floor are open from 10 a.m. to 5:30 p.m. Monday to Wednesday and from 10 a.m. to 5 p.m. Thursday.

menting it.

• "Safe and Secure Systems," a discussion of data, site and network security and power links, including equipment for uninterruptible power and transient suppression.

Exhibits on the floor are open from 10 a.m. to 5:30 p.m. Monday to Wednesday and from 10 a.m. to 5 p.m. Thursday.

ASM Annual To Investigate Resource Areas

ST. LOUIS — The Association for Systems Management (ASM) will zero in on technological and sociological issues facing information resource managers in the next decade at its 1979 annual conference April 25-28 at Stouffer's Riverfront Towers here.

Seminars on 27 topics, including two panel presentations, will span five areas of information resource — text, image, voice, data and management.

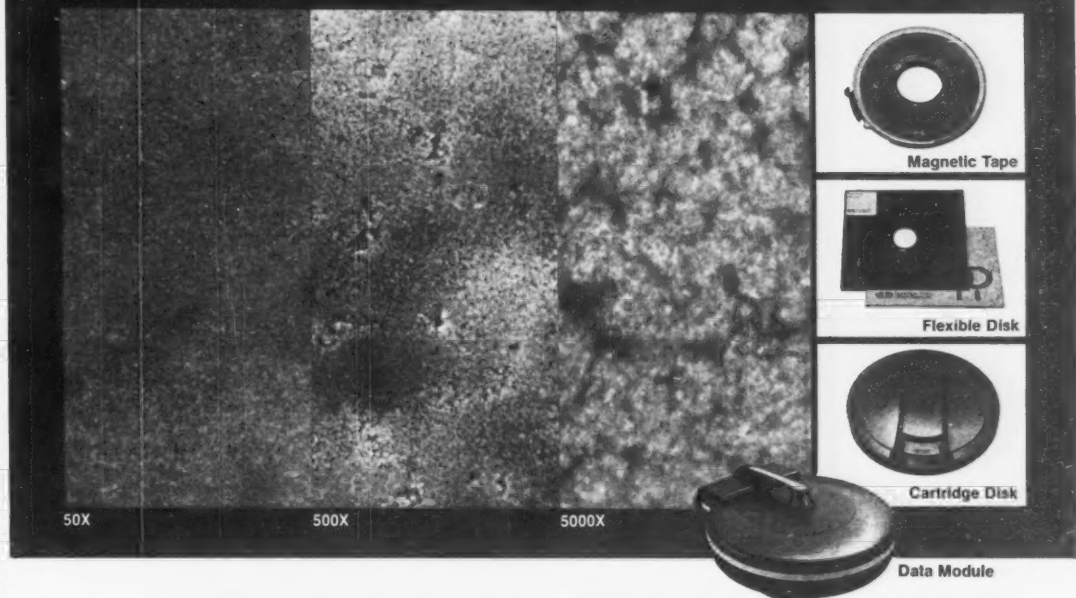
Coates to Keynote

Launching the conference this year will be a keynote address by Joseph Coates of the congressional Office of Technology Assessment. Coates will discuss the effects of technology on the individual, the business community and government in a speech entitled "Technology and the Challenge of the Eighties."

Full registration, including seminars, luncheons, and other social events, costs \$245 for ASM members and \$295 for nonmembers. One- and two-day registration fee schedules are also available.

More information is available from ASM at 24587 Bagley Road, Cleveland, Ohio 44138.

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The Engineers and Analysts Were on Their Toes

By Tim Scannell
CW Staff

SOMERVILLE, Mass. — You can fool some of the people some of the time, but just don't try anything when you're dealing with a group of engineers or systems analysts.

Armed with pocket calculators of every conceivable size and shape as well as years of practical experience, more than 100 software engineers and programming specialists attended a recent software cost-estimating seminar hosted by Quantitative Software Management, Inc. (QSM) (see story on Page 17). As QSM President Larry Putnam divulged reams of software management information and estimating techniques to his attentive audience, several participants disagreed with the QSM-produced figures and countered with their own theories.

One question fielded by Putnam dealt with the rationality of bringing people into a project late in the development stage. Although the added bodies might prove helpful in the long run, training the people initially might be detrimental to the entire project, an attendee suggested.

Putnam stated that although a person is brought in midway through a project, a company could have previously indoctrinated the person — usually at an additional expense — limiting any initial guidance period.

Another audience member noted that if a lot of people are added to a project at its peak, a company might not be able to carry them at the project's completion. This would result in a lot of engineers and programmers being out of jobs at the end of each project period, the participant pointed out.

Small Systems Seen Vital For Future of Companies

COLUMBUS, Ohio — Companies without plans for widespread use of small computer systems may not survive in the future.

That opinion was expressed recently at a two-day conference on minicomputers and microprocessors held at Battelle's Columbus Laboratories. At the conference — part of the Battelle Technical Inputs to Planning subscription service — Battelle researchers discussed the applications of small computers to manufacturing, quality assurance, materials handling and process control.

"If a product has a moving part or provides information, it might profitably use a microprocessor," according to Battelle's Dr. L. Neil Kanning. "It seems that the limitations of today's microprocessors are only in the mind and imagination of the user."

Furthermore, he suggested companies use proven hardware and reusable software, and he detailed five essential steps for developing any microprocessor program.

These include defining basic needs, converting needs to features, performing trade-off studies, preparing specifications and establishing management controls.

In addition, advances in computer technology have greatly increased the options for process product designers, according to Barry J. Brownstein. It is now possible to economically embody as much intelligence in computers as is necessary for performing duties, he said.

"However, all this new technology is not without its pitfalls," he cautioned the more than 100 managers and senior-level business representatives attending the conference. "Skills must be developed to use the hardware effectively, and design personnel must learn to take advantage of the increased capabilities."

Brownstein explained that the expanded application of computer process control is mostly owing to the new continuum of computing power. Integrated circuit, or chip, technology, he said, has made it possible to package the intelligence of large computers into increasingly smaller space.

"The result is that small computers are a reality, and today's process and product designs have a full spectrum of systems available for use," he remarked. "As computer manufacturing becomes a matter of etching patterns into .25 sq in. pieces of silicon, the advantages of mass production will lower unit costs."

Brownstein said that computers have both advantages and disadvantages as process controllers. Generally, they are faster, more accurate, more repeatable and less susceptible to environmental factors than their human counterparts. But computers are far less flexible than people, especially in reacting to new stimuli, he concluded.

Battelle researchers cited a wide variety of applications for computer systems. William A. Young, for example, explained how five air logistic centers in the U.S. are using computers to produce aircraft parts.

The air centers are the manufacturing arms of the U.S. Air Force, exhibiting all the characteristics of an industrial facility, Young said. Numerically controlled (NC) machine tools are in use, with programming and machine productivity becoming increasing concerns, he added.

For the centers, Battelle designed an integrated manufacturing system that automates the preparation of part manufacturing programs for NC machines. It literally places the NC machine on-line to the programmer's terminal, he said.

In another area, Robert L. Heilman cited computer graphics as a design and part-production tool. "The graphics are useful in areas where the information communicated is conceptual rather than detailed and in areas where the information is inherently geometric," he explained.

In the design stage of process planning, graphics are useful to check plant layout, to get visual results of mathematical modeling, to analyze the process techniques and to monitor the process, Heilman said. Graphics also are useful and cost-effective in a variety of manufacturing processes, particularly in designing and making parts, he added.

When It Comes to Costs . . .

Software Development Called 'Guessing Game'

By Tim Scannell

CW Staff

SOMERVILLE, Mass. — Determining long-term software costs and pinpointing project expenses in a DP world hit hard by inflation and skyrocketing prices is, at best, an "intelligent guessing game," Larry Putnam, president of Quantitative Software Management, Inc. (QSM), stated here recently.

Successful systems analysts and computer engineers must be able to roll with the developmental punches and adapt programs and work flows to compensate for various personnel, equipment and schedule changes. If not, the hope of attaining economical and dependable software will never be more than a twinkle in a project manager's eye, the head of the Virginia-based software planning and control company said.

Putnam is the developer of the Software Life Cycle Management (Slim) system, a time-sharing package that reportedly enables managers to estimate and then control the cost of medium- or large-scale programming projects. QSM held a two-day seminar here recently dealing with the problems of establishing cost, manpower and time boundaries in software endeavors. The seminar was co-sponsored by the American Institute of Aeronautics and Astronautics (AIAA) and the Technical Marketing Society of America.

Speaking before a mostly engineering audience, Putnam and QSM Vice-President Ann Fitzsimmons stressed the importance of avoiding such software development pitfalls as cost overruns, schedule slippages and intradepartmental communications breakdowns — or "noise." Industrial and governmental agencies are spending more and more on sophisticated computers and asking their programming staff to deliver more cost-effective programs to help pay for this equipment and rationalize its existence, Putnam explained.

In fact, U.S. corporations and government facilities spend an estimated \$15 billion to \$25 billion annually on software development, rivaling equipment expenditures, he pointed out.

Poor Estimates

One of the major problems in software development is poor project resource estimation, the QSM president said. Since software management and development, as a science is still in its infancy — there is no way to arrive at exact cost or time estimates.

Managers must be and usually are satisfied with "ballpark" answers. However, those same managers also want to be aware of certain trade-offs in the project and how they could decrease the final software price tag or developmental time period, he noted.

Offering the analogy of a rocket ship blasting off toward a distant planet, Putnam stated that programmers must be able to adapt and vary projects and programming flows according to different environmental changes. "Where we are and where we intend to go" as well as data stream and trajectory are just as important in programming as they are in space travel, he observed.

"A decision maker needs to know

some bounds to be able to get inside Yankee Stadium," Putnam said, pointing out the necessity of ballpark figures in relation to a project's course. And managers can draw upon past experiences as well as actual computer simulation to establish estimated bounds.

Putnam noted that the software myth of productivity being a constant that is determined by management and the myth that the final product is directly proportional to the amount of expended effort just that — myths. Quantitative software management involves determining just how many people will be involved in the project, how long it will take, how much it will

cost, how much manpower is needed, the cash flow necessary, what risks are involved and what trade-offs are available, Putnam said.

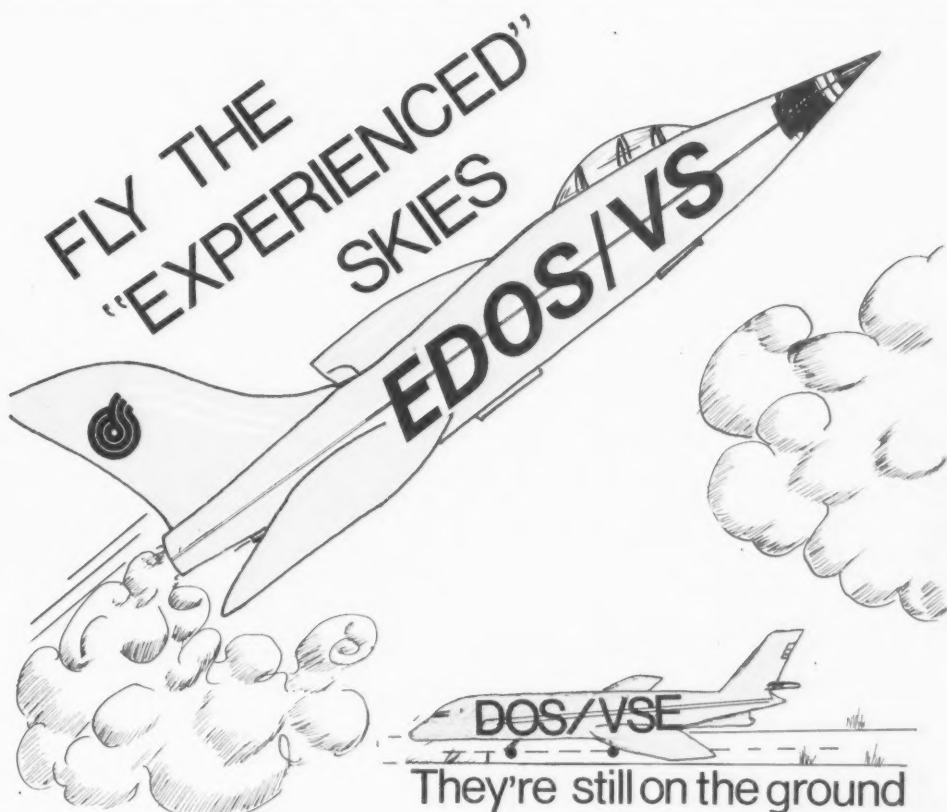
Early system characteristics and a viable means of updating and controlling the project once it is under way are vital to the successful completion of the program, he emphasized.

Putnam explained that all software projects follow a life cycle pattern like that designed by IBM's Peter Norden and formulated by Lord Rayleigh, a 19th century British mathematician, to describe other phenomena. The life cycle curve, shaped like a smooth hump, includes development time, test and validation, design and coding and in-

stallation and — after customer delivery — and modification and enhancement.

Following the Norden-Rayleigh model, project managers usually discover that estimated costs are invariably far less than actual costs of the programming project and they can make paper revisions of the effort before any actual time or money is expended. "After you've been burned a few times," Putnam said, "you begin to pad your budget to allow for setbacks and delays."

However, "don't try to get four-place decimal accuracy in software development modeling or estimations because it's not there."



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EFT Providers Bewail Cost of Privacy Legislation

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — The banking industry received an unpleasant shock this year as it prepared to implement the Right to Financial Privacy Act, passed last October. Bankers found that complying with one minor section of the law would cost an estimated \$1 billion.

Congress took a hurried second look at the new statute and repealed the costly provision, arguing the legislation had escaped close scrutiny in the rush to pass the privacy law before Congress ended its legislative session last fall [CW, March 19.] But proponents of the law called the \$1 billion estimate highly inflated and complained that Congress knuckled under

to intense lobbying by the banking industry in repealing that section.

The episode illustrated a problem of growing concern to American businesses as they face the ever-multiplying number of state and federal privacy statutes.

The unknown costs, in both dollars and man-hours, of complying with the laws have seriously dampened the enthusiasm of companies to be "good corporate citizens" and defenders of their customers' personal privacy.

The problem was brought up last week when representatives of the electronic financial services industry came together here to discuss the impact of "Public Policy Issues in Financial Communications." At the same time, a few miles away on Capitol Hill, mem-

bers of what is being called "The Privacy Congress" prepared to begin considering a spate of new privacy bills.

'Mind-Boggling' Statistics

At a two-day meeting of the Electronic Funds Transfer Association (EFTA), participants were told that the statistics on domestic privacy legislation are already "mind-boggling." Evan Hendricks, editor of the "Access Reports/Privacy" newsletter, noted about 150 state privacy laws and three main federal statutes — the Fair Credit Reporting Act, the Privacy Act of 1974 and the Right to Financial Privacy Act — deal with the subject.

Despite all these laws, "there is no absolute when you're talking about

privacy," Hendricks said. The laws represent a balance between rights to privacy and the need for certain information by government and commercial entities; in EFT, the balance is between privacy and increased efficiency, he added.

Another speaker at the EFTA meeting, Brian Smith, general counsel of the Interbank Card Association, said his organization recognizes "we have to be good corporate citizens" and protect the security of its system. But "Interbank is faced with enormous compliance problems."

Interbank is the switching agent for the bank card transactions of more than 1,100 financial institutions in 120 countries and all 50 U.S. states. It operates a switching system based in St. Louis that uses lines leased from common carriers.

The Interbank system does not contain any data bases of personal information; it merely provides the financial communications links between its members companies. As such, the organization is not covered by many of the privacy laws now in effect or being considered, Smith said.

Even so, the St. Louis center handles approximately two million transactions a day and "it's clear we have to do something to preserve the integrity of the data that goes through our system."

Besides the fact that "privacy, security, data protection are sexy subjects" that have caught the public's interest and well-publicized instances of banking fraud such as the recent Rifkin case have aroused public concern, Interbank feels it must provide a secure system because its members are covered by privacy laws. The organization is constantly examining the various laws going into effect both domestically and abroad to see what statutes, if any, cover Interbank.

Problem of Interpretation

Interbank maintains a "negative file" capability to provide the services of any of its members should an individual member's in-house equipment break down. This capability only duplicates the member's system and is used according to the member's rules and procedures, Smith explained.

He does not think that capability brings Interbank under the jurisdiction of most privacy laws, but said he worries that privacy authorities, especially abroad, might think otherwise.

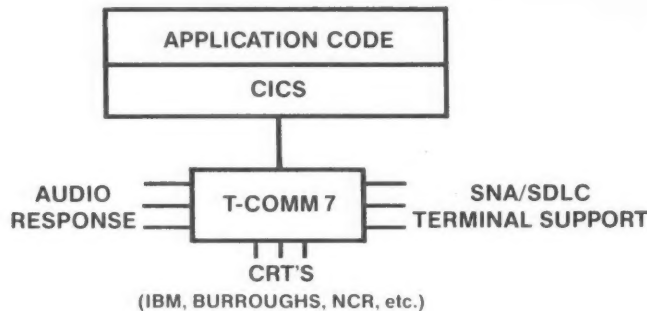
"The problem is enormous," Smith said. Interbank is in the uncomfortable position of not being covered by privacy laws but having to constantly monitor legislation to see if it will be covered in future laws or interpretations of existing laws, he explained.

The problem is compounded by the large number of jurisdictions in which Interbank operates.

The prospect of future, more inclusive privacy legislation, plus the desire to offer a secure system, has prompted Interbank to develop a data encryption hardware module for use on its system.

Smith said he hopes EFT providers, by committing themselves to securing their systems, will be able to forestall "the hue and cry for over regulation and over legislation before EFT gets off the ground."

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Private Sector Sees Opportunity Fed May Have Competition for ACH Services

By Marguerite Zientara

CW Staff

HOUSTON — If the Federal Reserve System adopts its proposed pricing schedule for automated clearinghouse (ACH) DP services that are now free, private-sector suppliers could be competitive with the "Fed" by the mid-1980s, when ACH transaction volumes mature to a much higher level.

That was the conclusion reached by Robert G. Finney, president of Western Union Teleprocessing, Inc. of Mahwah, N.J., when he spoke at the recent annual conference of the National Automated ClearingHouse Association (Nacha) here recently.

While ACH services are now provided essentially free by the Fed to member banks, the banks are required to keep a certain percentage of their daily deposits on reserve with the Fed without interest accrual.

The pricing schedule was proposed last November by the Fed's Board of Governors and is now under consideration by the banking industry. Essentially, the proposal addresses the large sums of money on which member banks presently do not earn interest.

Private-Sector Competition

According to economic models developed by Western Union, Finney said that if banks were charged for ACH processing services at the prices proposed by the Fed on a per-transaction basis, a private-sector supplier could compete at traffic levels projected for the mid-1980s.

Effective competition will not emerge in the near future, however, he noted, because of the present growth rate of ACH transaction volumes.

This analysis, Finney pointed out, is based on an approach that superimposes an ACH service on existing facilities and systems, thereby reducing costs and risks.

The Federal Reserve System currently operates 31 of the 32 regional

ACH facilities, handling electronic payments and settlement activities for the nation's banks.

Conflicting Objectives

In attempting to arrive at meaningful ACH pricing levels, the financial community is faced with conflicting objectives, Finney said. "From one viewpoint, pricing levels should be high enough to encourage the private sector to risk investment capital, and from another viewpoint, they should be low enough to encourage the use of this electronic payment mechanism."

Finney identified two key factors that should be considered by private suppliers in the development of ACH services. The first is "the degree to which providing ACH services can be cost-effectively meshed with teleprocessing facilities already in place and being operated by the prospective nongovernment suppliers."

The second factor to consider, he asserted, is ACH transaction volume and its growth pattern.

"A private supplier who seeks to provide both processing and communication services faces a major challenge if the game plan is to start from scratch," Finney said.

Starting such a service would entail developing a system to provide nationwide service "with all this implies in terms of specialized data handling and transmission capability."

It would require a high capital investment with resultant high fixed costs. "Under such conditions, being price-competitive with the Fed would be virtually impossible."

From the supplier's viewpoint, Finney said, the pricing schedule and the apparent volume must provide a fair recovery rate of the initial capital investment and ongoing operating costs within an acceptable risk factor and time frame.

"The solution to this problem," he continued, "is that the level of investment, the ongoing costs and the resultant risks can be reduced by private-sector suppliers who are able to design a meaningful ACH service within the

structure of existing facilities."

Potential suppliers who can develop this superimposition approach could minimize the need for additional capital expenditures and include the costs and risks within the structure of a broader service offering, he said, "making it much easier to add incremental ACH capacity as volume grows."

As a case in point, Finney cited Western Union's computerized message-switching facilities and satellite communications system, which he said represent the type of "in-place capability" that could provide nationwide ACH processing and communications services.

Afips Calls Fed Guidelines For EFT Act 'Unacceptable'

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — Electronic banking has been called the wave of the future, but it now appears the consumer may get caught in a riptide of government electronic funds transfer (EFT) regulations, according to a recent review of new federal guidelines.

A panel of experts assembled by the American Federation of Information Processing Societies (Afips) was highly critical of regulations developed by the Federal Reserve Board to implement the recently passed EFT Act of 1978 [CW, Oct. 23].

An ad hoc subcommittee of the Afips Special Committee on EFT disagreed with a "Fed" decision that a consumer can be liable for "unlimited" losses suffered by a financial institution through unauthorized use of the consumer's EFT card if he fails to notify the bank within 60 days that the card has been lost or stolen.

The panel said the regulation misconstrues the language of the EFT act and does not adhere to congressional intent concerning the extent of consumer liability in EFT transactions.

The Fed regulation states, "If the consumer fails to report within 60 days of transmittal of the periodic [bank] statement any unauthorized electronic fund transfer which appears on the statement, the consumer may be liable for the amount of any unauthorized transfer."

Although the rule also requires that the financial institution be able to establish when the consumer learned of the loss or theft and prove the unauthorized transfers "would not have occurred but for the failure of the consumer to notify the financial institution," the Afips group said the regulation is unacceptable.

The EFT Act "does not provide for such unlimited liability under any circumstances," the panel said. "A thorough reading" of the law "gives the impression that consumer liability in any case is limited to \$500."

The liability provisions constitute one of several sections of the law that went into effect Feb. 8. The Fed determined the extent of consumer liability as follows in regulations promulgated March 21:

- Liability for unauthorized transfers is limited to \$50 if the consumer reports the loss or theft of his card within two business days.

- The consumer is liable for up to \$500 if he notifies the financial institution

(Continued on Page 20)



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Ex-Justice Goldberg Sees Privacy Major Issue

By Jeffrey Beeler

CW West Coast Bureau
SANTA CLARA, Calif. — Retired Supreme Court Justice Arthur J. Goldberg recently called privacy the most pressing computer-related issue currently facing the U.S. public.

Although Goldberg admitted he knows almost nothing about the technical side of computing, he said everything

he has heard and read about the subject suggests "we should all be concerned about the very real threat computers pose to the privacy of the individual citizen."

A society can't call itself civilized unless it can protect the privacy of its members," the ex-Justice added, "so the possible use of computers to intrude into our personal lives creates a fundamental prob-

lem, in my opinion."

Goldberg voiced particular concern about the privacy threat posed by federal data banks and by the proposed schemes to network them. He urged computer users and scientists to devise new, more effective techniques for limiting government access to confidential data files.

"Not being a computer expert, I don't know what those techniques would be, but I think they would have to be possible," Goldberg speculated. "Someone simply has to invent them."

If computer users and scientists fail to develop safeguards that can restrain federal agencies from compiling and sharing data files on private citizens, "Congress will have to do the job instead."

Goldberg, who served as U.S. ambassador to the United Nations before returning to private law practice in New York City and Washington, D.C., commented on the computers-and-privacy controversy during an interview at the University of Santa Clara (USC), where he is a member of the law school faculty.

A few minutes before the interview, Goldberg had discussed the dangers of nuclear proliferation as the featured speaker at a USC symposium on high technology and its international impact.

Earlier during the symposium, another speaker — Amdahl Corp.'s deputy chairman, Eugene White — had also commented on the computer privacy issue, though from a somewhat different viewpoint from Goldberg's.

During a brief question-and-answer session following his address on "The Impact of High Technology and the Large Computer System," White said grave concerns about inadequate data security measures had slowed the pace of DP installations throughout the U.S.

"Hardware vendors could automate many more applications than they have in the past if they could only figure out how to protect the propriety of their users' data," the Amdahl official noted.

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CW499

Afips Critical of Rules Pertaining to EFT Act

(Continued from Page 19)
tion within 60 days after receiving a bank statement showing unauthorized EFT transactions.

The unlimited liability provision takes effect after the 60-day period. The Fed also said that extenuating reasons for not reporting a lost or stolen card must be taken into account.

The majority of the Afips panel, however, agreed that "\$50 is a reasonable limit; \$500 is adequate; and unlimited liability or even liability to the unauthorized use is unacceptable."

The panel also complained that although the law places the legal burden on the financial institution "to establish when reimbursements must be made," the Fed regulations would mean "the actual burden is on the consumer."

If there is a disagreement between the bank and the consumer over alleged error in an EFT account, the law does not provide for any mediations of the dispute, the panel noted.

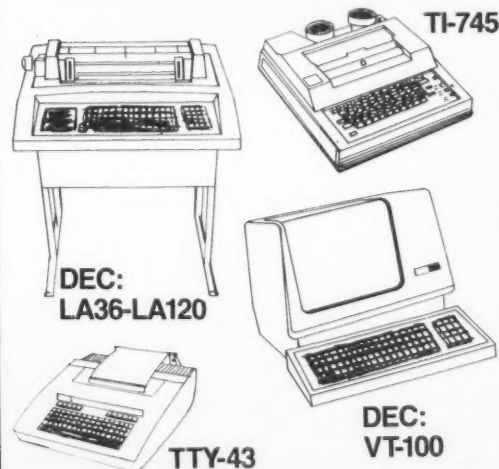
"To gain a third party hearing on this matter, the consumer must apparently sue the financial institution in court." The panel said this is "a reversal of the traditional burden found in the typical credit transaction."

The Afips panel consisted of

Malcolm M. Jones of the First National Bank of Denver; Dr. John L. King of the University of California at Irvine; John C. Lautsch of the law firm of Davis, Stafford, Kellman and Fenwick in Palo Alto, Calif.; and Pender M. McCarter of the Afips Washington office.

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Managers on the Move

EDWARD B. CODD has joined Hoover Universal, Inc. as manager of systems and programming in its DP services organization located in Jackson, Mich.

In this newly established position, Codd will be responsible for the systems analysis and programming functions related to the development and implementation of the company's systems.

Most recently, Codd was director of research and development for the Commission on Professional and Hospital Activities, in Ann Arbor, Mich.

He holds a bachelors degree in electrical engineering from Manhattan College and a B.S. degree in business administration from Florida Southern College.

...

ANTHONY W. BILOTTI AND FREDERICK E. POLLOCK JR. have been appointed computer services officers for the Bank of New Jersey and will work in the bank's Moorestown Operations Center.

Bilotti continues as systems and programming manager of the Computer Services Department, a position he has held since he joined the bank in 1976. He attended St. Joseph's Evening College.

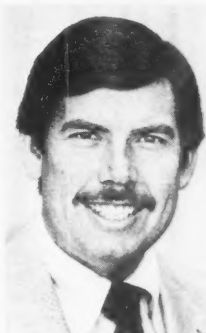
Pollock, who joined the bank in 1973, will retain his job as technical services manager in the Computer Services Department.

He received his B.S. degree from Drexel University and is a member of Beta Gamma Sigma, the national business administration honor society.

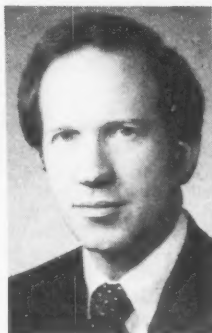
...

JOHN M. PAGE has been named DP manager of the Anderson Division of Dresser Industries, Inc. of Worcester, Mass.

Page holds a B.A. degree from the State University of New York at Potsdam.



Banks



Petty



Ryan

ROBERT C. PETTY has been promoted to senior vice-president of Trust Co. of Georgia, headquartered in Atlanta. He will act as manager of Trusco Data Systems (TDA) administration and will plan and coordinate systemwide operation, including data processing.

Petty joined the Trust Co. staff in 1966. Prior to his promotion, he was group vice-president.

He is an alumnus of Georgia Tech and holds an MBA degree from the Wharton School of Business at the University of Pennsylvania. Four operations officers were also named to TDA. They are Mark H. Deaton, John D. Fiebigler, Horace R. Umphries and Howard Vosburg III.

...

WILLIAM GALE has been appointed DP manager at A.W. Chesterton Co. of Stoneham, Mass., with responsibility for staff and systems of the worldwide company.

Gale joined Chesterton after working more than 16 years at IBM. For six of those years he was an advisory marketing representative.

He graduated from Tufts University with a B.A. in economics and is studying for a master's degree in business administration at Boston University.

JAMES J. RYAN has been named vice-president of corporate management information services for McGraw-Hill, Inc. in New York. He will have corporatewide responsibility for all of the company's systems and computer applications.

Ryan comes to McGraw-Hill from the Singer Co., where he served as director of systems development.

A graduate of St. Peter's College with a bachelor of science degree, Ryan is a member of the American Management Association.

...

DAVID R. TOLE has joined Vecta Contract in Dallas as systems manager. He is responsible for the development and implementation of corporate systems and procedures.

Prior to joining Vecta, Tole was systems manager for Steelcase of Canada, Ltd. in Toronto. Vecta is a subsidiary of Steelcase.

Toe's experience includes 13 years with four major Canadian corporations, where he worked in computer operations, operations programming, corporate analysis and data processing.

...

MICHAEL E. BANKS has been named vice-president and director of information systems at the Beverly Hills Federal Savings and Loan Association. He has responsibility for all management information systems and DP activities.

Banks most recently developed his own computer consulting firm, Frawley and Banks, and before that served as western regional general manager for Remote Computing Corp.

He holds an applied mathematics degree from California State University at Long Beach and an MBA from the University of Southern California.

...

MICHAEL JABLONSKI has been appointed operations manager of Systems and Computer Technology Corp. (SCT), of Malvern, Pa.

Jablonski's responsibilities at his previous employer, Northampton County Area Community College (NCACC), included operation of the school's computers and supervising personnel at the computer center.

He was one of several persons hired by SCT from NCACC as members of an SCT team to upgrade NCACC computer-supported services. He will continue working at the school.

A Message for DP Managers

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Sixteen "program sessions" are slated — each to be keynoted by such speakers as Richard Wiley, ex-chairman of the Federal Communications Commission Harold O'Kelley,

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Calendar

May 14-16, Washington, D.C. — **Data Base Management Systems.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

May 14-16, Los Angeles — **Word Processing: Guidelines for Planning, Design and Implementation.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held May 21-23 in Washington, D.C.

May 14-18, Detroit — **Association for Educational Data Systems (Aeds) Annual Convention.** Contact: Art Daniels, Rams Cooperative, 31201 Dorchester, Madison Heights, Miss. 48071.

May 14-18, Palo Alto, Calif. — **Seminar on Decision and Risk Analysis.** Contact: Danette O'Neil, Seminar Coordinator, Decision Analysis Group, SRI International, 333 Ravenswood Ave., Menlo Park, Calif. 94025.

May 15-17, Detroit — **First Education Computer Fair,** sponsored by the Association for Educational Data Systems. Contact: Bruce G. Alcock, Riverdale Country School, W. 253rd St. and Fieldston Road, Bronx, N.Y. 10471.

May 15-18, Luxemburg, Austria — **Fourth European Congress on Information Systems and Networks.** Contact: Commission of European Communities, Jean Monnet Building, B4/029, Plateau de Kuchkey, P.O. Box 1907, Luxemburg, Austria.

May 15-18, Detroit — **Aeds 79,** sponsored by the Association for Educational Data Systems. Contact: AEDS 79, c/o Van Buren Public Schools, Board of Education, D. Belaire, 5555 W. Columbia, Belleville, Mich. 48111.

May 16-18, Washington, D.C. — **Data Processing: Introduction to Concepts and Systems.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held May 21-23 in Los Angeles.

May 16-18, San Francisco — **Distributed Systems: Are They Right for You?** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held May 30-June 1 in New York.

May 16-18, Atlanta — **User-Oriented Systems — A Major Challenge,** sponsored by Hospital Information Systems Sharing Group (HISSG). Contact: Clair G. Naylor, Chairman, HISSG Membership Committee, Suite 331, 10 S. Main St., Salt Lake City, Utah 84101.

May 16-18, Chicago — **Interpersonal Skills Lab,** sponsored by American Management Association (AMA). Contact: AMA, 135 W. 50th St., New York, N.Y. 10020.

May 17, Gaithersburg, Md. — **Trend and Applications**

1979: Advances in System Technology. Contact: Shirley Watkins, National Bureau of Standards, Tech A229, Washington, D.C. 20234.

May 20-23, Anaheim, Calif. — **National Operations and Automation Conference.** Contact: American Bankers Association, 1120 Connecticut Ave. N.W., Washington, D.C. 20036.

May 21-22, Bari, Italy — **Symposium on Symposium Criteria for Selecting Appropriate Technologies under Different Cultural, Technical and Social Conditions.** Contact: Ifip Secretariat, 3 Rue du Marche, CH-1204, Geneva, Switzerland.

May 21-23, Princeton, N.J. — **Ramis Coordinators' Roundtable.** Contact: Janet Levy, Mathematica Products Group, P.O. Box 2392, Princeton, N.J. 08540.

May 22-24, Washington, D.C. — **Fourth International Search Symposium.** Contact: Search Group, Inc., 1620 35th Ave., Sacramento, Calif. 95822.

May 23-25, Washington, D.C. — **DP Project Management: A Practical Approach.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

May 23-25, Chicago — **Data Communications: Effective Network Design.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held May 30-June 1 in Los Angeles.

May 23-25, Philadelphia — **Business Products and Environment Sales Expo 79 and Business & Personal Computer Sales Expo 79.** Contact: Produx 2000, Inc., Roosevelt

Bldv. and Mascher St., Philadelphia, Pa. 19120.

May 23-25, New York — **Data Processing Operations Management.** Contact: The University of Chicago, Center for Continuing Education, 1307 E. 60th St., Chicago, Ill. 60637.

May 21-22, Washington, D.C. — **Minicomputers and Small Business Computers.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

May 21-22, New York — **Data Communications: Advanced Concepts and Systems.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held May 31-June 1 in San Francisco.

May 21-23, Los Angeles — **Data Base Management Systems.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

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May 21-23, San Francisco — **Computer Performance Measurement.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

May 21-22, San Francisco — **New Technologies in the Health Care Industry.** Contact: Robert S. First, Inc., 707 Westchester Ave., White Plains, N.Y. 10604.

May 28-30, Paris — **Teleinformatics 79.** Contact: Afcet, Conference Secretary, 156 Blvd. Pereire, 75017 Paris, France.

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Reading time: 1 minute, 10 seconds.

1. Can you tell who is killing your response time by running games like STARTREK, HEARTS, or NFL STATS during prime time? Yes ☐ No ☐
2. Do you know when CLIST's go into a loop or when they are misused and severely impact other users? Yes ☐ No ☐
3. Do you try to convince your auditor that you can manage TSO without any consistent form of audit trail? Yes ☐ No ☐
4. Do you have a systematic way to summarize your monthly TSO usage on one page so that management can easily pinpoint problems and make trend projections? Yes ☐ No ☐
5. Do you know when users are "violating" the installation standards and security rules in using TSO? Yes ☐ No ☐
6. Is your only approach to TSO management the generation of ad hoc, one of a kind, special reports? Yes ☐ No ☐
7. If you use IBM's SPF, do you know which menus and functions your users are using? Yes ☐ No ☐
8. Are you trying to manage your TSO operation by an average response time measure only? Yes ☐ No ☐
9. Can you tell which users are using which commands, programs, and CLIST's, when, with what frequency, and at what level of resource consumption? Yes ☐ No ☐

If you answered NO to 6 of the questions. (or you're just curious), we strongly recommend immediate consultation with those folks who have chased the TSO crazies. Call or write Mario, Tom, Doug, Lou Ann, or John today, tell them your test results and they will send you information that will start you on the road to full recovery. After all, 150 cures worldwide speaks for itself.

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Editorial

The Other Shoe Drops

The news that IBM will be charging extra for formerly free maintenance services [CW, April 2] shows clearly that the firm is moving toward more unbundling of both software and maintenance services.

When the 4300 series of computers was announced, IBM admitted it was charging for software that was previously "free" and charging for maintenance of all software, also a formerly "free" or bundled service.

However, the firm was less open about the increased charges for maintenance, revealing the plan only under questioning from users and the press. Obviously, the various plans have both advantages and disadvantages for users, depending on how much they need the software and services provided by IBM.

Before unbundling began at IBM in 1969, all maintenance and software (both application and systems software) were provided as part of the purchase or rental price of a computer system. Since that time, IBM has increasingly unbundled software engineering services and applications programs.

With the announcements of the 8100 Information System and the System/38 last year, IBM began unbundling, or charging separately, for operating systems software. When the 4300 series was introduced, the move to unbundled operating systems grew into the medium- to large-scale IBM line, with the firm charging for several operating system features that were previously free. Furthermore, the firm is now charging for maintenance

outside a prescribed nine-hour period on Monday through Friday.

These trends will be good for users who do not need all the previous IBM services — often the larger and more sophisticated users. They can carefully decide which of the IBM software packages and maintenance services they need and end up paying less for the total system than before, when all the charges were included in the base price of the system.

Previously, these users were essentially paying for services and software they did not use. Even if they only needed certain services, they had to pay for all since they were part of the overall rental or purchase price.

However, the less sophisticated users, who want and need a lot of "hand holding" from IBM, may end up paying more, since they will probably opt for maximum IBM software and service.

It will be increasingly difficult for these users to tell exactly what they will be paying for their systems. The pricing structure is one of "nickel and dime" charges that can add up to large amounts over the life of a system.

All these separate charges for previously "free" services will increase the importance of careful planning among users. All users will have to take a very careful look at what their total bill will be before they opt for systems that are very competitive on a strict hardware price basis.

Data Past

Five Years Ago April 10, 1974

Events nationwide this week indicated state DP consolidation efforts were on a rocky road:

- In Boston, centralized computer operations hit a snag when the state Supreme Judicial Court declared consolidation to be unconstitutional because it violated the doctrine of separation of powers. The Massachusetts plan had called for a single DP system to serve both the legislative and executive branches.

- In Phoenix, a bill calling for consolidation brought direct confrontation between the governor and a state senator on the issue of privacy. Gov. John R. Williams contended that DP centralization posed clear threats to the rights of citizens.

- In Baton Rouge, La., political infighting and complaints from user departments promised to sabotage the centralization plans already in place.

Eight Years Ago April 14, 1971

WASHINGTON, D.C. — The existence of a data bank whose contents included the names of elected officials, black militants and opponents of the Vietnam War was revealed this week in a *New York Times* article. The data bank was described as containing dossiers on elected officials and even political moderates who were believed to condone civil disobedience. None of these persons had actually violated any laws.

NEW YORK — Despite creeping inflation, programmer salary decreases ranging from 2% to 10% in the past year were reported by Robert Half Personnel Agencies. The survey showed the average starting salary for an experienced junior programmer at a large installation had fallen 6.5% from the previous year. The most dramatically affected were DP managers, whose starting salaries were reported off by a full 10%.



Letters to the Editor

About Brooks' Challenge

In response to the challenge by Rep. Jack Brooks (D-Texas) to firms that might threaten to boycott the government DP market [CW, March 26], the answer from this private citizen engaged in DP is: "You'll see us try, Jack, and we'll beat you down."

I don't know where the sympathies of *Computerworld's* readers lie in the bitter antagonism between the federal government and private industry. I, for one, am tired of politely taking every mean, vicious verbal abuse that any second-rater living off taxpayers' money cares to dish out.

Brooks' suggested threats to bring reluctant suppliers into line; his statement that they are "just as vulnerable to a bitter, mean, cutthroat broadside attack as anyone else" and his remark that they can "shove it in their ear" were not facetious. Saying so was an attempt to defuse them.

Businesspeople know, although many of them don't want to admit it, that Brooks, in those words, was precisely stating the formal policy of the federal government. He was representing the President, Congress and the federal courts.

The computer manufacturers know it, the petrochemical industry knows it, the primary metals industry knows it, the farmers know it, the automobile industry knows it, the tobacco industry knows it, the banking community knows it, private schools and colleges know it and even the news media know it.

But the federal government's campaign, essentially an educational effort requiring perhaps 25 years for successful completion, has some 18 years yet remaining.

Brooks and his cronies won't make it. Technology is moving too fast, and businesspeople have already begun to master its use.

Long before the federal takeover

of all business can be accomplished, all our fundamental business procedures and activities will be automated, under the rules of private free enterprise. When the Brooks types are finally ready to make their last, bold move, the only way to make it will be to turn off the computers.

If they don't, their threats, their "mean, cutthroat broadside attacks" will meet with the simple response, "Does not compute."

John E. Steely Jr.

Syria, Va.

Good Managers Get Hurt

I am writing in reference to Harvey Weiss' reader commentary which addressed the apparent lack of preparation of DP facilities for recession or cost cutbacks [CW, March 19].

I agree with Weiss that it is not uncommon for the average DP manager to be more technical than business-oriented. Unfortunately, an advantage which accrues to the inefficient DP manager is that he often has the flexibility to sustain cutbacks without impairment to his operation or service.

Paradoxically, it is often the manager who runs the efficient operation who suffers most in the cutback. Most corporations, when cutting back, generally do not have the time or information available to trim the true fat from the organization.

What is often made is an across-the-board cutback, which penalizes the individual running the efficient organization.

Robert P. Dallesandro
New York, N.Y.

Computerworld welcomes comments from its readers. Letters should be addressed to: Editor, *Computerworld*, 797 Washington St., Newton, Mass. 02160.

Reader Commentary

Performance Appraisal: Missed Opportunity

By Norman H. Carter

Special to CW

"You've done a fine job in the past year. Oh, there's a few things we need to talk about — such as a little more effort in meeting your schedules, some consideration about budget control — but, overall, a good performance."

"Oh yes, here's a raise notice. The amount reflects my confidence in you. OK, let's go to lunch."

So go most performance appraisal interviews.

Once a year. General statements. "Let's get it over and go eat."

What a waste of an opportunity. No wonder most of our people don't really know how they are doing, what we want from them or how to get there. Many leave, searching for better management and professional direction. Others stay and do the best they can.

As a manager, however, it's your responsibility to appraise individuals' performance well and more frequently. Performance appraisal has four parts: preparation — yours and the employee's; the performance coaching discussion and goal setting; ranking of performance; and planning for succession.

The Preparation Phase

Preparation takes time. It must include:

- Careful evaluation of the individual's performance based upon his position description and the job aids provided by the company — for instance, the adherence to the systems development standards and guidelines or program test and assembly performance in accordance with the programming standard.

• Evaluation of each specific work or project objective established at the prior evaluation to determine status. This should take into consideration whether the work was completed on time and within budget and, if not, the causes and whether they were controllable or uncontrollable.

• Compilation of specific tasks or items on which the individual has performed well or poorly with appropriate commendation or corrective action required.

Preparation will take at least an hour per person, but be assured that if you do not spend it in positive preparation, you will spend it later defending your evaluation or possibly interviewing an applicant because the incumbent left you for lack of evaluation and direction.

While you are doing this preparation, the individual should be doing the same evaluation.

Coaching and Goal Setting

The performance appraisal should be held in a private, comfortable environment and about an hour should be allocated. To ensure that the atmosphere is the most conducive to discussion, the time should be mutually agreed upon, rather than dictated by the manager.

Using the position description, which should be task-oriented, not general responsibility statements, each point on the evaluation should be discussed freely and agreement reached.

Where goals are to be set, the individual should not be allowed to set too many goals through enthusiasm and thus set an environment for failure in the future.

When training is observed to be required, specific courses should be pinpointed and tentative schedules set, rather than accepting general vague training goals and objectives such as "needs to know more about CICS."

If corrective action or upgrading of performance to a minimum standard is needed, then the objective must be clearly stated, the acceptable performance described and a schedule for review of progress identified. If outside factors may impede performance, they must be identified and noted.

The coaching discussion is difficult and demanding, but it is one of the most satisfying elements of managing people as results begin to

emerge. It will probably need to be repeated at least twice each year if real addition to performance is the goal.

It is not a monologue, but an open creative dialogue between a professional and the manager — between equals, not between master and subordinate.

Ranking of Performance

Even when performance evaluation is well done, it often stops at the coaching discussion. This premature stop wastes one critical opportunity for the manager and company.

Once individuals have been evaluated, the manager should rank all individuals in a top to bottom listing. My firm has developed a 10-point ranking scale to assist in this activity.

The objectives of ranking are twofold:

- To identify outstanding performers as well as marginal performers and to identify possible supervisory and managerial talent.
- To ensure that inconsistencies in evaluation resulting from the "halo effect" and other observations do not affect an individual's rating.

Planning for Succession

Finally, the ranking and performance evaluations can be used to

(Continued on Page 27)

The Human Connection PCM Sees a Future In Operating Systems

By Jack Stone

Special to CW

A special breed of plug-compatible manufacturer (PCM) takes on the really tough jobs "in daring to be great." I'm referring to those hearty souls who sell CPUs head to head against IBM to displace large-scale mainframes.

The payoff is there in spades for those who succeed. One company which appears to be gathering in the chips is the Intel Corp., a New York Stock Exchange firm headquartered in San Francisco.

Intel did about \$650 million total business in calendar 1978 and is expected to do about \$1 billion in calendar 1979. About half of Intel's income derives from the marketing of IBM-compatible equipment.

P. David Pappert, president of Intel's Federal Division in Washington, D.C., who is responsible for marketing the company's DP products to the federal government, consented to an interview: Q. Dave, just how successful have the PCMs been in penetrating the IBM marketplace?

A. Let's talk about our primary market, which consists of customers who operate machines in the 370/158 and 3031 class and

the 370/168 and 3032 class. These represent installations whose total hardware, on a purchase-equivalent basis, is valued in the ranges of \$1 million to \$2 million and \$2 million to \$6 million, respectively.

By our figuring, plug-compatible mainframes have replaced about 500 of the 2,500 or so installations in these categories, affecting around \$1 billion worth of the installed base. That number may be small in IBM terms, but it is very large in our terms, and it's growing for us every day.

What's Your Formula?

Q. Those are impressive figures, to say the least. Can you give us your formula for competing against IBM? I assume that your company must be doing many things right. We all know IBM's reputation for providing reliable products and services and developing a strong customer following, many of whom would rather "fight than switch."

A. As you might expect, our strategy is based on technology advantage and installation support. Both are very important.

With respect to technology, we

(Continued on Page 26)

The Taylor Report Data Exchange Proposed For Contract Negotiating

By Alan Taylor

Special to CW

In response to the questionnaire on how much coverage users get from computer contracts [CW, Feb. 5], one user-lawyer proposed that this column help by providing an information exchange.

"The only negotiation leverage that most small or medium-sized users have with a large vendor is if they know of specific contractual changes that the vendor granted to other customers," he explained.

Another user-lawyer wrote that he had mostly negotiated with small and medium-sized vendors with good results. "We as users are actively involved in developing the finest contractual protections available," he said.

Moreover, "we believe we are succeeding and are getting fair agreements with our vendors... we are trying to evaluate our methods and develop our technique before we take on the larger vendors."

Open negotiations with vendors are well worth the effort, he believes. Without them, "we [are] susceptible to any number of problems."

As "one of the largest shops" in

his state, his firm gives "utmost concern" to its equipment and software performance so that customers are not disappointed, he said.

For an information exchange to be effective, it is necessary to

A worldwide response to the 'Smart' paint project is the subject of next week's Taylor Report. This sound-reducing paint could impact procurement methods for terminals by next year.

identify some of the problems that plague users. For example, negotiations often eat up a lot of time. One of the user-lawyers who wrote to me said that after a particular technical decision was made, it took more than a year before an adequate contract was drawn up.

He didn't tell me the cost, but I can make a few guesses about it. And remember, technical as well as legal time is a cost factor.

The lawyer's conclusion was "if a customer can afford legal counsel, and is willing to 'hang tough' (Continued on Page 26)

PCM Sees Its Future in Operating Systems

(Continued from Page 25)

believe that our equipment represents substantial improvements over comparable IBM machinery because we, as well as our colleagues in the industry, are able to exploit current technology to the fullest.

Frankly, at this point in time, we feel that our equipment is much superior to that of IBM's, based on generally accepted measures.

Q. Until, of course, IBM decides to announce a machine with more advanced technology...

A. Prudence certainly suggests that we assume IBM has the capability for such an announcement at nearly any time — witness the E series announcement that impacted mid-

scale 370 machine.

But, as of this time, IBM has chosen to live with the technology in its large-scale machines, much of which is nearly a decade old, and maintains its installed base of business. With this IBM policy in force, we have had the business "umbrella" we needed to grow and prosper.

Now we feel we have the resources to deal with any announcement coming forth from IBM that may potentially affect our area of the business.

What About Vendor Support?

Q. With respect to vendor support, what does your company do to ensure hardware compatibility with

the IBM software product line? This would seem to be a major problem, what with the many different operating systems that IBM provides and the continuing stream of changes and upgrades.

A. We maintain a very elaborate technical data center on the West Coast. It houses several of the Ite mainframes alongside comparable IBM equipment and enables our technical people to test IBM software, making changes in our hardware that may be necessary. Fortunately, our microcode allows changes to be incorporated without too much difficulty.

In addition, we have our own marketing, systems engineering and field engineering forces to assure

our customers that field problems will be handled effectively and promptly.

Q. How do you view your overall impact in the marketplace?

A. The [PCMs] have shown that they can provide and support viable alternatives to IBM centerpiece products, with substantial benefits to the customers.

And I personally think that it's only a matter of time before independent vendors will be offering their own operating systems — for a fee — which will have significant price/performance advantages over IBM software and yet provide complete compatibility with customer programs written in IBM source code.

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Letters to Stone should be addressed to him at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

Exchange Urged For Contracts

(Continued from Page 25)

while negotiating, he can arrive at a reasonable agreement."

Without such negotiations, which do add costs and delays, an alternative is the "industry-standard contract." This, according to the user-lawyer, is "signed without being reviewed by a lawyer who knows anything about computers."

The problems with the industry-standard contracts were reviewed by the lawyer in his responses to the questionnaire. "The terms of a vendor agreement are not explained in clear English," he said. Moreover, "the terms used, as a general rule, are not specifically defined" nor are they made clear to technical or management staff.

In addition, "the precise makeup of the overall agreement is not known, and the contract does not guarantee that special terms or specifications will be met."

"There are often no requirements for system uptime and no remedies for failure of maintenance. Spare parts are usually not covered at all."

"The contract gives the user no remedies that allow him to continue his operations without losing his rights; generally, no user remedies at all are provided," he noted. The contract "always contains a limit on damages unrelated to the size of the risks taken by a user."

On the whole, such a contract certainly gives a poor level of protection.

The question now is, will you help? An exchange is no good with nothing to exchange. If you have some specific information that you will provide regarding computer contracts or if you have a contract problem you would like to see addressed in this column, please write to me at Computerworld, 797 Washington St., Newton, Mass. 02160.

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The First: Management Training Five Actions Can Ready Sites for Recession

By Harvey M. Weiss

Special to CW

"Is Your DP Site Prepared for a Recession?" was the question I posed several weeks ago [CW, March 19]. I suggested that several activities could be instigated at the corporate level to bring the DP function under control in these troubled financial times.

Let's look at those solutions.

The first act is to implement sound management training programs for DP management. Effective DP managers know they are providing a service to the rest of the corporate entity. Therefore, they understand the requirement to be responsive to their customers' needs.

The training program should cover those subjects necessary to turn the "technician" manager into the "business" managers of a technical function. Included in a course outline would be such subjects as business systems analysis (as opposed to computer systems analysis), business finance, personnel management and resource management.

The result of such a program will be the development of a manager capable of making the technical resources under his command meet the business needs of the company it serves.

User Education

The second effort that must take place is the education of the user of the DP resource. These training programs should be the opposite of the one for the DPer. They should consist of those topics necessary to inform the user of the intricacies and techniques of DP.

Included in the subject matter would be such topics as the systems approach to problem solving, the components of computer system design, how to utilize the computer as a tool to perform one's work and even the basics of computer pro-

gram design.

The third step in this clean-up of the DP problem is for top management — i.e., corporate decision makers — to commit itself to ensure user involvement in the design, implementation and maintenance of the corporate computer-based systems. Why a commitment from so high a level?

Without it, the politics, fears and power plays typically found at the middle-management level will abound. DP has often become the "ball" in these political football games. Top management involvement will eliminate or reduce this condition.

Formal Standards

Another effort that must take place is the development and installation of a formal set of methodology and performance standards. Even in the smallest of DP organizations, standards are required to control the design of computer systems.

There must be standards on how the DP center is organized, how work is processed, how DP and the user interface with each other and how long each activity should take. There should not only be standards, but they should be up-to-date and enforced.

Continuous Auditing

The last suggestion in bringing the DP center into line is that the DP center should be audited on a continuing basis, by the corporate internal auditors or by independent consultants.

The internal auditor should be capable of reviewing and ensuring the system design to verify its capability to: (1) work, (2) work as intended and (3) contain the controls necessary to prevent the losses so vividly described by other authors on the subject.

The independent consultant usu-

ally specializes in specific areas of concern. Thus the DP center can be reviewed by one capable of evaluating the status, noting the problem areas and recommending solutions.

Reader Commentary

The implementation of the five activities noted above will keep your DP center from straying the straight and narrow. A corporate management commitment will force user involvement. Training programs will provide the knowledge necessary for both areas to converse intelligently. Standards will control wasted effort and bring costs into line. The audit of the entire scene will provide expert analysis and plans for improving the situation where in-house talent fails.

Reversing the Situation

If your DP center is already in the throes of the problem just discussed, how can the situation be rectified? The DP center cannot be eliminated. If the DP staff is continually fighting fires always trying to fix systems — it will never have the time to clean up its own environment.

Thus, the first step is for corporate management to recognize the symptoms of the disease that have been identified. Once it recognizes that a problem exists, a written plan must be developed to clean house.

More often than not, the DP manager will not even recognize the situation. Thus, corporate management should use the independent consultant to help.

If the DP manager does see the problem but does not have the staff to perform the work, again the consultant should be used. The outsider can identify enough waste, loss of control and unsuccessful work to begin solving the problem. Even so, corporate management will have to commit itself to implementing the solutions.

In summary, let me review some facts, DP costs can equal up to 5% of the cost of doing business. Yet an investment of this size and magnitude is often managed and controlled by one incapable of doing so. Thus, waste runs rampant.

In order to prevent such a situation from occurring, a corporate commitment to a five-pronged plan is required. If the situation has already occurred, outside help must be used to reestablish the necessary controlled environment.

Weiss is president of Weiss & Associates, management consultants, in Denver.

Performance Appraisal: A Missed Opportunity?

(Continued from Page 25)

provide the basis for assigning specific developmental tasks and training for individuals who appear to have the ability to advance to management positions. In this way, constantly expanding performance can be expected, evaluated and made to provide a return for the individual and the company.

Performance appraisal is often viewed as a chore to be done as quickly as possible once a year. With an expanded view of this procedure, however, the individual can be provided with a more challenging set of objectives in which there has been participation from the beginning and in which goals have been set which realistically meet the job and company requirements.

On the other hand, the manager having completed the bilateral process and coaching discussions

will have a more accurate view of the capabilities and need of each individual in the organization and will begin to observe individuals with a more precise eye.

The Company Gains

Finally, the company will gain because it will build a more comprehensively evaluated and trained work force. Where these performance appraisal approaches and standards have been used, the results have been those which contribute to company and individual growth — professionally increased performance (quality and quantity) and reduction to turnover.

Carter is president of Development Systems International and Design Services International in Los Angeles and the author of several books and articles on management and computing systems.

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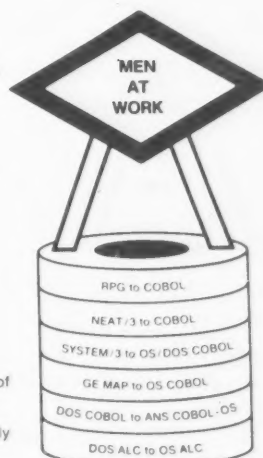
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Harry's Micro: The Birth of a Department

By Joe Rigo
Special to CW

Officially, my friend Harry is training manager for the Small Bird Division of Intergalactic Pet Foods, Ltd. In reality he runs the division's illicit data processing department.

His equipment is a Radio Shack TRS-80 microcomputer. His staff is anyone who has a legitimate application and is willing to spend a few hours learning Basic.

Intergalactic's central Corporate Systems Department knows about Harry. It isn't really comfortable with what he is doing, but it leaves him alone because it doesn't want to admit he has a real computer.

Harry is not really a computer person. He majored in math in col-

lege, but he never took a programming course in his life. He just happened to have jobs where he

Reader Commentary

worked closely with systems people.

In particular, he once worked for a large bank. The bank had a central data center with three IBM 360/65s pounding away day and night. It also had a lot of powerful department heads who wanted their own computers.

The department heads felt it took

too long and cost too much for the corporate systems staff to get new applications up and running. It also bothered them to be so dependent on technical people who worked in someone else's department. The corporate staff argued that it was important to maintain control and compatibility among the bank's accounting and recordkeeping systems.

There was a compromise. The department heads were allowed to get their own IBM Model 20s. They could do preliminary editing of input data for systems that would be run in the central data center.

It was a good move. The users were able to find and correct a lot of errors that would have spoiled

the overnight batch processing runs. They were also able to slip a few of their own small applications onto the machine.

Harry was responsible for spotting technically oriented people in the department and training them to code simple programs in RPG. Mainly, they were able to sort and report data to meet special needs that the main system was not programmed to handle.

Move to Intergalactic

When Harry moved to Intergalactic, he found a central data processing department with a large IBM system. He also found that several of the larger divisions had their own independent, minicomputer systems, based on Digital Equipment Corp. and Data General equipment.

Harry's department was not large enough for one of these systems. He had to rely on the corporate staff or beg for help from one of the mini groups.

For a long time, Harry simply forgot about computers and concentrated on being a training manager. Then, about a year ago, he joined an amateur computer club and started reading the personal computing magazines.

After a few weeks, he bought a small system. It was just a keyboard, screen and tape cassette unit. But after a few more weeks, he added a printer and two floppy disks and lugged it all into the office.

The micro wouldn't do half the things that Harry wanted, but he didn't care. Neither did his boss. They finally had their own computer installation.

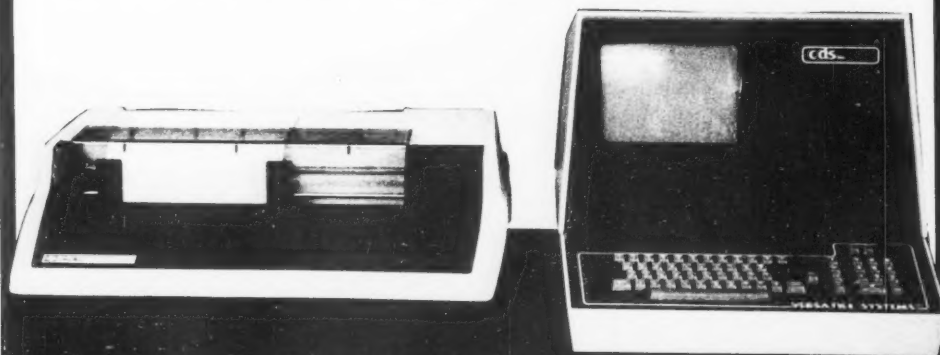
A Dozen Applications

Harry now has about a dozen applications on the system, and there are ideas for many more. For the most part, they help one or two people in the department automate part of their work.

For example, one application uses information about advertising plans to predict requirements for increased bird food production. The company knows from experience that an ad directed to hummingbird lovers will generate a certain percentage of response and that the response will be spread over a period of two to four months.

(Continued on Page 34)

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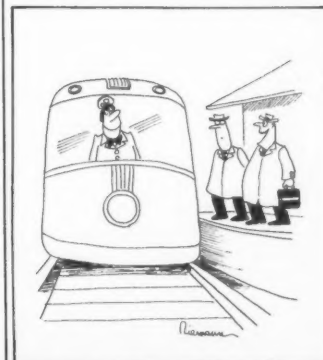
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'It's Run by a Computer. He's Just There to Exude Confidence to the Commuters.'

Through Training, Scheduling Want Better Runs? Improve Operator Morale

By Mark Morris

Special to CW

Data processing is becoming faster and faster. Jobs that might have taken hours 10 years ago now run in a fraction of the time. But all these increases in speed and technology are for naught if, because of a human error, a job must be rerun.

If the job that failed is a substantial one and the DP facility is busy, it could be days before processing is back on schedule. In the meantime, the users are frustrated, the supervisors are harried and the operators' morale drops to next to nothing.

Human errors will always occur, of course, but if the frequency of these occurrences can be reduced by improved communications, procedures and documentation, much runtime can be saved.

Comprehensive Training

During training, the operator should be familiarized not only with the operations of the hardware, but also with ways to interpret the documentation. Knowing how long a job usually takes, what sort of output to expect and other characteristics peculiar to a job before it's run can save a lot of headaches later on.

If the type of processing varies on the different shifts, each operator should be trained on each shift. Then, in a pinch, any operator can work any shift and still feel confident in his knowledge of that shift's procedures.

Thorough and up-to-date run documentation should be maintained on all jobs. The documentation should include the approximate amount of required runtime, any required input, the expected output, any error messages and restart procedures in case of a crash.

With this information close at hand, the operator can quickly detect any problems that may arise while running a job.

Realistic Run Schedule

The run schedule, prepared by the operations manager, should include the name of the job to be run, the approximate time required to start the job and the names and numbers of any required input tapes. The jobs should be scheduled reasonably,

with adequate time given to each job based on past experience.

The different shifts should also be as balanced as possible, with about the same amount of work done on each shift.

Input should be clearly labeled and kept at a designated location. Many valuable minutes can be wasted hunting down an input tape. Output should also be placed at a designated spot and clearly labeled by job to prevent its being lost or thrown out by mistake.

Good shift turnover between operators is vital to a smoothly run DP facility. At least one-half hour of overlap should be allowed when

scheduling operators.

During this time, the in-coming operator can find out what is running, how far along the jobs are and

Reader Commentary

whether the previous operator has been having any hardware or software problems. There is nothing worse than finding out that a tape drive has been acting up only after it has torn up a tape.

Operating a computer tends to be

rather tedious. The longer the operator's shift, the higher the chance of an error caused by fatigue. Shifts over eight hours long should be avoided if possible. There should be enough operators to provide adequate backup without having to extend the length of the other operators' shifts in case one gets sick or quits.

Operational Support

Hardware and software support should be available during the same hours the installation is operating. When calling in hardware support on unsupervised shifts, the

(Continued on Page 34)

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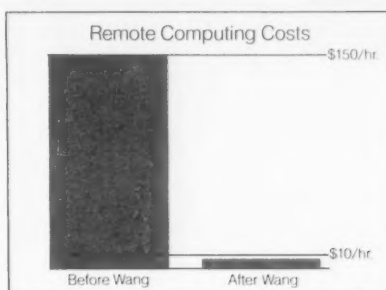
The problem was, time-sharing was causing as many problems as it was solving.

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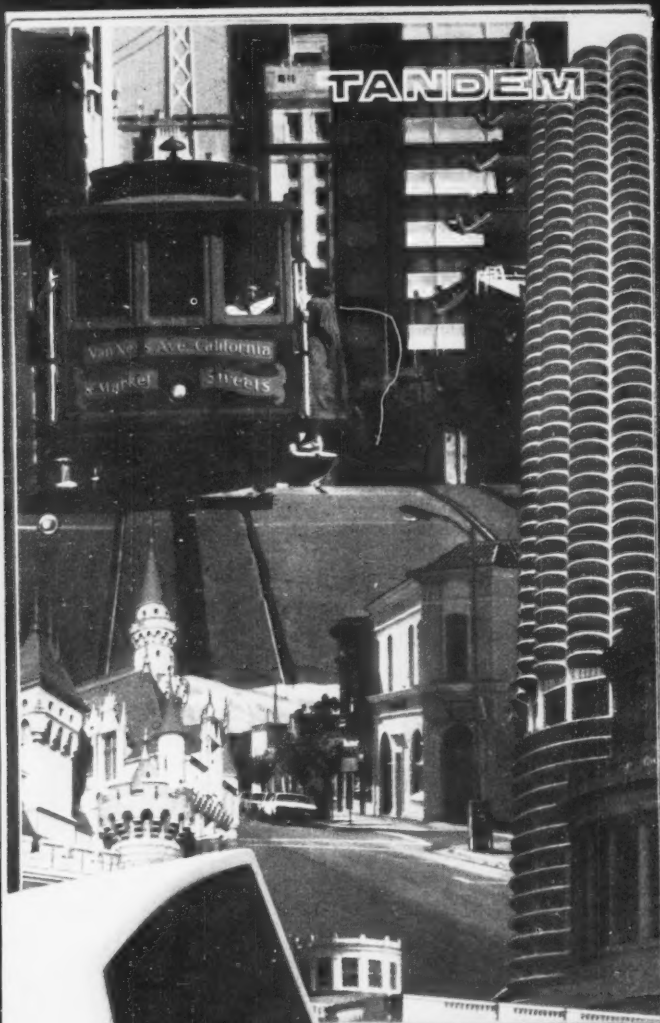
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Conventional fixed network is difficult and expensive to expand and modify as needs grow. And they always do. Communication and utilization of data base records from twice removed nodes is prohibitively expensive in applications programming, so more lines are the only viable solution. And that is expensive, too.

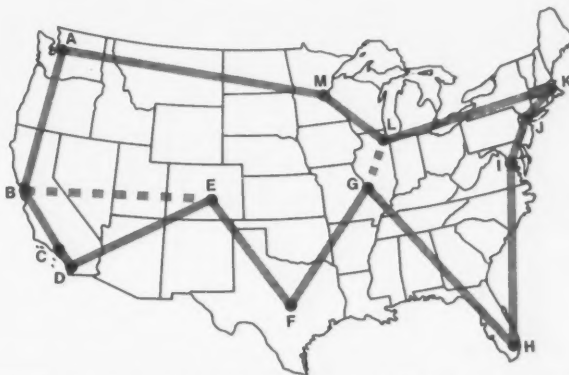
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Tandem pass-through packet switching enables "A" to communicate with "E" at no penalty in system overhead. And you can add direct lines, per "B" to "E" or "L" to "G" whenever traffic warrants without disrupting system performance or efficiency. Note that nodes can be of variable sizes, all using Tandem NonStop Systems as the common element. Efficient, powerful and extremely low cost.

system, and best-route switching automatically circumvents the trouble spot. If there is a failure in the communication link, the system will automatically go around it. The system and the network stay up and running, and best of all—the data is intact, its integrity assured.

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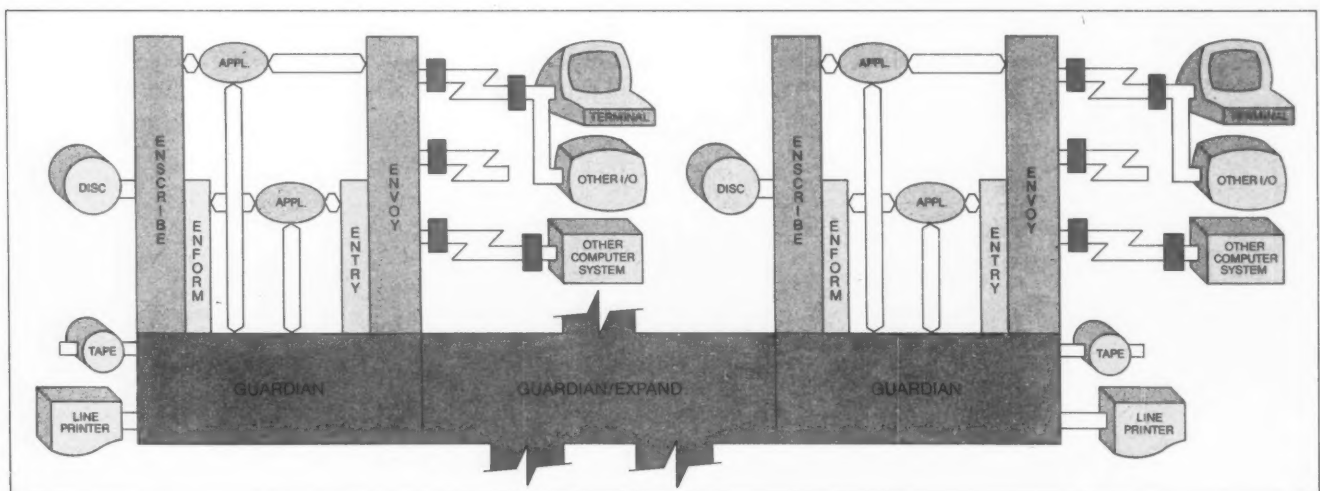
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And Redefinition of Job Image Problem Eased With Change of Title

By Bruce Abele

Special to CW

A recent article in *Computerworld* covered a survey by Deutsch, Shea & Evans, Inc. that indicated image is a major concern to DPers ["Profile of a Typical DP: Plagued by Image Problems," CW, Jan. 29]. Lack of participation in the decision-making process, poor working conditions and lack of promotional opportunities were some specific complaints. There is a tendency to treat DPers as if they were servants.

Inappropriate titles combined with a correspondingly inappropriate view of the profession have certainly contributed to the image problem. Data processing is the function of computers, not people. "Management information" implies that DPers provide information for others who are capable of making decisions. The connotations of the word "programmer" are well known.

The time has come, it appears, for the profession to consider some significant shifts in direction.

A New Label

First, our efforts are better labeled with the term "administrative research" as it is used in the business schools, since our job is to guide people toward a common objective. The name fits. A materials requirement planning system, for example, guides people by helping them order and schedule so the objective of lower inventories and improved deliveries will be obtained.

Needless to say, the process of proper titling will be evolutionary. In the meantime, simply approaching the job with the outlook of an administrative researcher will improve the situation.

To date, there has been little true research in administration. In fact, because of that, past efforts would be better labeled "administrative engineering."

The reason is clear. Few people know of a science which could support the effort. And without a supporting science, research is haphazard and is not likely to produce results.

It is equivalent to trying to find a better metal but knowing nothing about metallurgy or chemistry. Re-

sults are achieved very slowly. However, there may be hope.

There is a science, or more precisely a discipline, which is as basic to administration as geometry is to architecture. It has been hidden from the public by some very serious semantic problems. It is called the discipline of cybernetics and should be carefully differentiated from the descriptive subject of the same name covering computers, robots and automation.

The discipline is similar to geometry except that the vocabulary and generalities relate to a world of change instead of a world of shapes. Regulation, control, infor-

mation, cause and effect, machines and even intelligence are categories of change and are covered by the discipline.

Reader Commentary

The opportunities for improvement are significant. Anyone who doubts this should look closely at the bureaucracy problems prevalent in government, big business and many large organizations. Those problems are not the signs of

good administration.

It seems fitting that this type of research should fall on the shoulders of DPers. In many if not most cases, ensuring the effectiveness of new administrative methods requires close coordination of available hardware and software resources.

It would seem that DPers should have an easy time with the discipline of cybernetics, a subject difficult for some because of precise and very broad abstractions.

Those interested in supporting this expanded function should therefore take a long, hard look at the discipline of cybernetics.

(Continued on Page 34)

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Harry's Micro: Birth of a DP Department

(Continued from Page 28)

The micro takes input about advertising plans for the coming year. It uses this to determine how many additional pounds of chopped insects will have to be produced each month.

It is a simple application. It saves one person about two hours of paper work each week. Harry's other applications are on about the same level.

None of the applications is big, by corporate standards. But, then, neither is the system.

Harry has all the problems of a data center manager. Printers and disk drives need maintenance. Programmers quit. Applications must be documented, and files must be

backed up.

Still, he is happy. And he is looking forward to future development.

So far, Harry's computer is little more than a big calculator. It saves people time in working out math

problems.

Now one of the division managers wants to use it in a different way. He wants it to maintain his lists of people who attend the company's management training courses.

Boosted Morale Means Better Runs

(Continued from Page 29)

operator should be able to use his discretion. An experienced operator can generally tell whether a problem is hardware-related.

An on-call schedule should be arranged with the programming personnel to provide software support for programming problems that might arise. In this way, the opera-

tor can get help instantly, no matter what types of problems occur.

Easily Instituted

Most of these measures can be easily and inexpensively instituted at most medium- to large-scale DP facilities. They can effectively reduce the number of mistakes made during operation and can provide a

great deal of extra runtime. When processing is on schedule, the operators, users and supervisors are happier. The morale of the entire DP facility is improved, generating even more efficiency.

So before you purchase more core to improve turnaround time, you might save your money and improve on the human element first. Morris is a computer operator in Chico, Calif.

Change of Title Boosts Image

(Continued from Page 33)

Successful research takes advantage of and does not reinvent what has already been invented. A medical researcher, for example, has available well-indexed sources of information to help him avoid duplicating someone else's efforts.

Unfortunate Fact

Unfortunately, administrative research is not yet even a valid library category. We need to identify and define administrative problems that have broad applicability. An example of such a problem might be the classical one of spending to use up the budget at year's end in order to maintain an established level of funding.

A second form of contribution would be solutions or partial solutions to these types of problems. Finally, articulating some of the guidance provided by the discipline of cybernetics might be appropriate.

Reflect Efforts

In conclusion, DP titles should accurately reflect efforts. The emphasis should be on the high-level and important rather than the mundane aspects of the work. The title "administrative researcher" appears to perform that function.

DPers or others who are interested should take a hard look at the discipline of cybernetics as potential support for research in this area.

And, lastly, a publication should be established for the dissemination of research results.

Abele heads Bruce Abele Associates in Newtonville, Mass.

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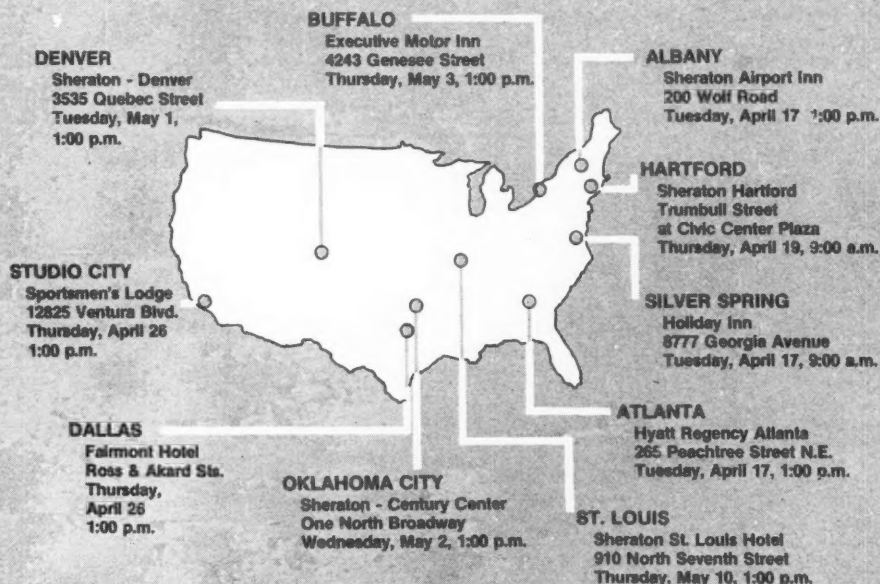
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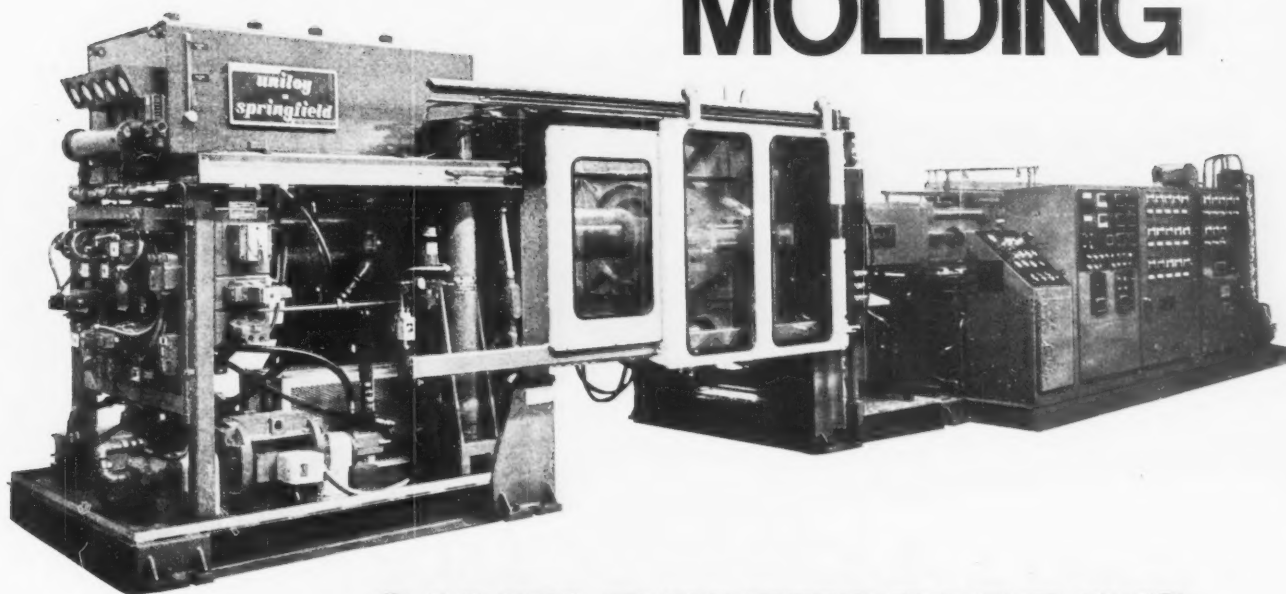
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Sex Bias Not Reason Women Promoted Slower

I would like to make some comments about "Women DPs Cite Promotion Bias" [CW, March 5].

Why do women feel that just because John Smith received a promotion three years earlier, they are being discriminated against? Did it ever occur to these women that maybe their managerial skills have not developed as fast?

I have met many educated women who have not learned to cope with tension, stress or deadlines. Many very competent women are not decision makers and are afraid to accept challenges or to tread into unknown territories.

I have often heard intelligent women remark, "Do you think I can do the work?" This type of comment would never be made by their male

counterparts.

Self-confidence is one of the major tools to successful management; confidence is needed to accept challenges, to make decisions and to delegate responsibility.

Women try so hard to succeed, they fail to delegate proper responsibility. If a woman can't decide which pair of shoes to buy, how is she going to make decisions that will affect a corporation?

The intention here is not to downgrade women; I am one myself. Many excellent management candidates are among them, but too much blame is being placed on sex discrimination.

Isn't it possible that the reason it

takes women longer to get ahead is that it takes many women longer to mature into people with leadership abilities and the confidence to be decision makers?

Florence F. Marks

Richardson, Texas

So Much for Sisterhood

I was surprised by the recent letters regarding Ida Mason's article on the way women tend to view risk [CW, Feb. 19]. I agree with the findings she reported and support her view that this tendency toward the safe route vs. the risky route isn't necessarily bad; it depends on the situation.

Letters to the Editor

What is strange, however, is that an article by a woman dealing with an issue concerning women sparked complaints from other women.

So much for the notion of a united sisterhood!

Sheilah Burchby

Bethlehem, Pa.

Any Data Entry Groups?

Does anyone know of an association that represents the data processing profession (i.e. programmers, operators, analysts, data entry personnel and so forth) in employee-employer relations?

We are interested in contacting such an organization or any group (particularly in California) interested in representing our professions.

We can be reached at 4080 Lemon Ave., Riverside, Calif. 92501.

Ron Mansfield
Chairman

Data Processing Employee
Committee
Riverside, Calif.

Forum Topic

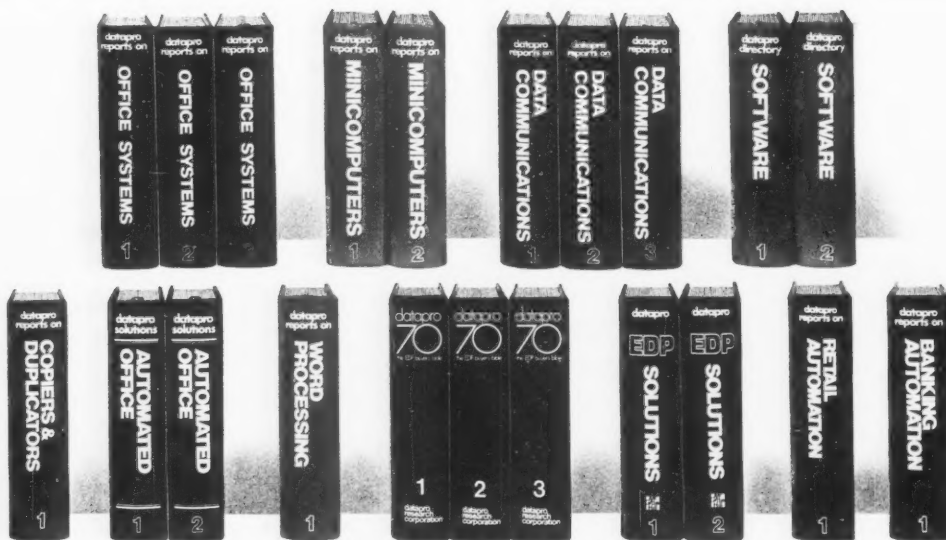
Regarding the article about our May seminar in Washington, D.C., on IBM's rapidly evolving systems architecture, the headline, "Problems of SNA Subject of Forum," as well as the opening sentence could be misleading. [CW, March 12].

IBM has recently introduced NPDA for network problem determination, as well as an approach for connecting non-Systems Network Architecture (SNA) terminals to an SNA network and enhanced distributed data processing capabilities. Unfortunately, this was misinterpreted both in the lead of your article and in the headline.

Our seminar is being held almost in its entirety to provide in-depth understanding of formats and protocols for any organization involved in configuring a system to support SNA.

Dr. Leonard Kleinrock
President

Technology Transfer, Inc.
Los Angeles, Calif.



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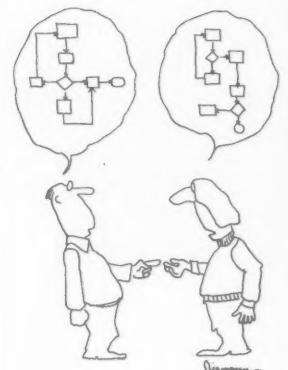
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With 'Docu/Master' Unstructured Data Backed In IBM Environments

NORWALK, Conn. — Docu/Master has been introduced by Turnkey Systems, Inc. (TSI) as a family of utility programs which provides complete facilities for the entry, maintenance and retrieval of unstructured data through IBM 370 and compatible mainframes running under DOS or OS environments.

The programs operate in on-line mode via teletypewriter or CRT terminals as well as in batch mode, according to the vendor. They are suited for large data base applications that require access by nontechnical personnel, a spokesman said.

The information that Docu/Master can store and retrieve can take any form, he said, citing reports, memos, transcripts, procedures, catalogs and survey results as some possible input documents.

Major application areas supported by Docu/Master, according to TSI, include on-line maintenance of reference material, storage and retrieval of research information, retrieval of documents in litigation and insurance policy writing. Claims processing, patent and copyright work, library science and support of government units also are possible with the package, the spokesman noted.

Docu/Master uses an indexing scheme which reportedly reduces the amount of disk space required. While most systems re-

quire index areas approximately one and a half times the size of the data area, according to TSI, Docu/Master's index areas are typically one-half that size.

Multilingual Dictionary

Docu/Master includes a multilingual dictionary that allows users to process and retrieve a file written in more than one language. The search strategy can locate information in a few seconds, essentially independent of the volume of information stored, the spokesman claimed.

During a search — in which any word in a document may be used as a search element — documents are either partially or completely displayed at a terminal. Off-line retrieval of documents is supported by routing the selected information to a printer or magnetic tape.

The on-line version of Docu/Master is available as an "unbundled" system for use with IBM's CICS or as a "bundled" system with TSI's teleprocessing monitor, Task/Master. TSI's data entry facility, Key/Master, can be used to front end Docu/Master, the spokesman added.

The DOS version of Docu/Master is available for \$45,000 or \$1,250/mo on a 36-month lease. The OS version costs \$60,000 or \$1,675/mo, TSI noted from 50 Washington St., Norwalk, Conn. 06854.

Any Comments On Pascal?

WASHINGTON, D.C. — A draft British standard for the Pascal language is currently available from the Computer and Business Equipment Manufacturers Association (Cbema). Comments on the draft should be returned to Cbema by May 15 in order to be compiled and forwarded to the British Standards Institute by the end of May.

The collation of American comments is being handled by the American National Standards X3J9 Technical Committee and the X3 Secretariat at Cbema "simply to avoid flooding our British colleagues with more paperwork than they can handle," according to X3J9 Secretary Jess M. Irwin.

Neither Irwin, his committee nor anyone at Cbema will modify or censor any comments received. All will be passed along "as is" after X3J9 puts them in some semblance of order.

Since Pascal is being considered for standardization in the U.S., X3J9 is likely to make note — for its own records — of any substantive comments on the British proposal, Irwin acknowledged.

The British draft is cataloged at Cbema as "97/5 N462 — Working Draft Specifications for Pascal" and is available for \$4 a copy. Requests for the document and comments about it should be sent to Catherine A. Kachurik, X3 administrative secretary at Cbema, 1828 L St., N.W., Washington, D.C. 20036.

Consortium Gives Access to College Data

Special to CW

COCOA, Fla. — Many educators think that accountability is nothing more than euphemism for reports and paper shuffling, which leaves little time and energy for tackling important academic and administrative problems.

However, accountability poses few problems for administrators of a three-college DP consortium based here. The consortium uses a computerized management information system (MIS) to provide on-line access to an integrated data base containing student records and financial data.

Brevard Community College, the anchor school, and Lake City and Central Florida Community Colleges use the system to supply the state of Florida with a myriad of detailed reports, required of all public educational institutions. The system also gathers statistics needed to produce state and federally mandated reports.

But the system — based on a Burroughs
(Continued on Page 42)



William Angel, data services director at Brevard Community College, modifies a program.

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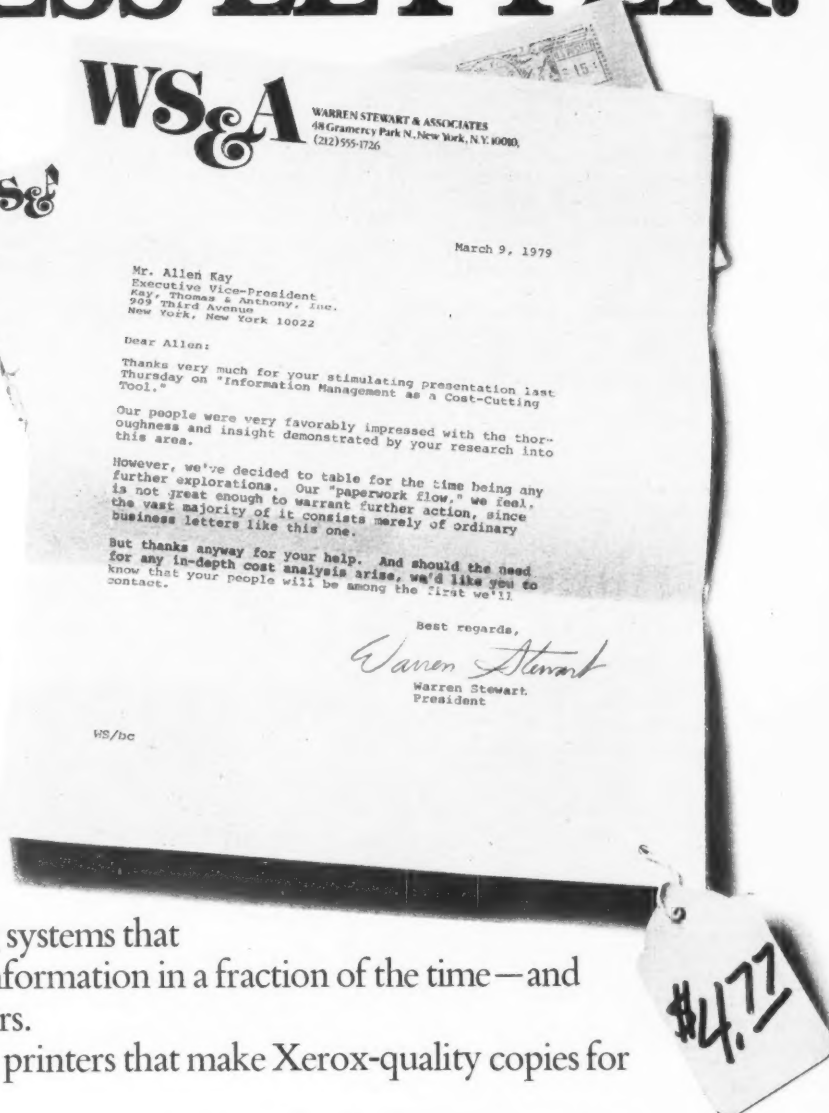
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More Than a Collection of Records

Data Base: A Slippery Concept, Hard to Define

By Rich Fennelly

Special to CW

With all the talk about data bases, someone who will remain anonymous asked, "What the heck is a data base?" "Well, the answer is easy," I told him. "Of course, a data base is a data base is a..."

"Now hold on," he said. "What's the problem? Why the verbal loop? Isn't it like a data set? We all know what that is: It's what we called a file before IBM renamed it."

"And a file has always been simply an organized collection of records," he added.

It's Like a Rose

"That's true," I said. "But the problem is this: A data base is like the rose; it is not a thing, it is an abstraction, a

quality of data. It varies according to the eyes of the beholder."

"But we call things data bases, don't we?" he asked.

"Yes, that's true," I said. "We have an Enrollment data base and two data sets collectively referred to as a Utilization data base... people take liberties."

"The truth of the matter is that data base is a direction, and the destination will be reached when we arrive at the big data center in the sky. A data base not only contains numeric representations of an outside reality — a number for a person, a code for a sex — it should reflect the relationships between pieces of data, the one to many and the many to one relationships."

"Furthermore, a data base goes beyond the realm of a single file. Depending on one's scope, it incorporates the data for an entire organization — nay, the world."

"Obviously, a true data base is beyond our earthly resources. Thus, we compromise and attempt to guess the most important relationships to meet the usual needs of a particular system or application and embody these into a data base structure."

My lengthy answer, being irrefutable, quickly ended the dialogue. However, it has no practical value.

The best that can be done is to list some characteristics of data, which some of the people some of the time

associate with data bases.

Therefore, for practical purposes, a data base is a data base to the extent that such a collection of data realizes these characteristics:

- Mirrors an organization.
- Meets the data needs of an organization or its subdivisions.
- Meets the data needs of a particular system, departmental or divisional application, corporate application or, especially, a management information system.
- Is shared across organizational lines.
- Is under the control of a data base management system (DBMS).

(Continued on Page 41)

Software Aimed At Manufacturer Fits PDP-11s

BROOKLYN, N.Y. — A manufacturers management system, written in modular form in Basic-Plus for use on Digital Equipment Corp. PDP-11 minicomputers, is now available from Bence Computer Consultants (BCC).

The system is applicable to all manufacturers that make either standard or custom products and is especially suited to any warehousing or distributing business, according to a spokesman.

Modules available in the menu-driven system include order entry for specific products or for production for stock, direction invoicing featuring a single pass from order to invoice and picking ticket invoicing, he noted.

Parts explosion, multiple orders on one invoice, division-to-division transfers and production control are also supported, he said.

Both book and physical inventory control, interactive accounts receivable with aged trial balance, customer statements and a cash journal as well as file maintenance on all master files are provided, the spokesman noted.

Other capabilities were said to include on-line inquiry, multiplant communications and order printing and management reports ranging from product summaries to year-to-date sales analyses.

With this range of capabilities, a user can overcome the time lags and loss of confidentiality that dependence on a service bureau might entail, the spokesman claimed.

Operates on PDP-11/34

The complete system is currently operational on a DEC PDP-11/34 running under RSTS/E Version 6C. Demonstrations are available at the user site (in Manhattan) or any place where a terminal can be hooked into a telephone line.

The complete software package costs \$60,000, but various modules can be used and acquired independently at lower costs.

Customization is also available, BCC added from 2664 Brown St., Brooklyn, N.Y. 11235.

'Generic Solution' Manufacturing Systems Provide Flexibility and Independence

The design and implementation techniques that have been used to develop most data processing support systems for manufacturing control have doomed those systems to unavoidable failure.

The root of the problem is change: change in products, change in manufacturing methods, change in company organization and management policies, and also change in the data processing environment.

All of these types of changes demand that the data processing systems change. They must change in functional terms, and sometimes in data processing terms. Unfortunately, the use of traditional systems design and implementation concepts results in systems that do not have the flexibility required to accommodate these demands for change. As a result, the functional capabilities of the system no longer fill the needs of the user and the system cannot and will not be used to support the manufacturing control process.

At Cincom Systems, we are responding to this need for flexible data processing systems for manufacturing control support. We have developed a system design and implementation technique called the 'Generic Solution' concept. By combining

the latest techniques in top-down and modular design approaches and structured programming concepts with flexible data base support facilities and high-level programming language, we can provide the best solution to the dual demands for functional flexibility and data processing environment independence.

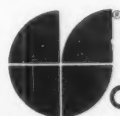
We have applied our 'Generic Solution' concept to the Material Requirements Planning area to produce our Manufacturing Material Planning System (MMPS) product. MMPS provides all the functions required to support an MRP control policy. These functional capabilities are implemented in an extremely flexible form that is designed to be easily modified and/or extended to meet each company's unique requirements, not only at the time of initial implementation, but also as users' needs evolve over time.

MMPS will be joined in the future by companion 'Generic Solution' systems for work-in-process planning and control, purchasing support, extended master scheduling support, and other areas to provide a family of Manufacturing Resources Planning Systems (MRPS) facilities.

We're very excited by the power of the 'Generic Solution' concept. Our experience in applying MMPS to a variety of MRP environments has been very positive and we expect that success to continue with all our MRPS products.

PROFILE:

Kevin McQuillen brings 13 years of experience in manufacturing systems design and implementation to his role as Manager of Application Products Development for Cincom Systems. He served in both consulting and data processing management capacities in a variety of manufacturing environments before joining Cincom Systems.



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How do you relocate a computer center 650 miles without disrupting service? EDP managers Eli Dabich and Jack Hiatt at Sun Life Insurance Company of America had only five months to find the answer.

"Thirteen CRTs in local mode at Baltimore headquarters were vital to our ongoing operations," Dabich recalled. "We had to plan, construct, and move to a new data center in Atlanta. There was no time to do all that and still develop

the software needed to operate remote CRTs plus unit record gear."

A Paradyne PIX II "Virtual" Data Link allowed the CRTs and unit record gear to continue operating in local mode. "We built a TP network without software changes, without a front end control unit, and without affecting our users," Dabich noted. "An IBM 370/138 and an HP-3000 were shipped, installed and operational, all within 31 hours, and we can support Baltimore users over a single line.

"We've had near-100% up-time since installing PIX II, and are planning our second link now," he concluded.

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Planning, Control System Operates on DG Eclipses

TORRANCE, Calif. — A manufacturing planning and control system designed to operate on Data General Corp. Eclipses under RDOS has been introduced by Compusource Corp. It is flexible enough for both the DP department and the end-user environment, a spokesman claimed.

Intended for use as an integrated system, the package includes a bill-of-materials processor, support for material requirements planning (MRP), a routing module and a work order status module. The various modules are available separately, the spokesman noted.

The on-line bill-of-materials processor supports 26 levels of product buildup and a "same as" capability that was said to save disk space by maintaining only exceptions to a basic bill of materials. Direct inquiry-of-multilevel bills and generation of "where used" listings are also supported, the spokesman said. The routing subsystem is included with the bill of materials processor.

On-Line Inquiry for Planning

The ability to provide on-line inquiry for time-series planning and pegging, coupled with a data base that handles a full-pegging system, make the MRP system "one of the most powerful in the industry," the spokesman claimed. It reportedly permits a minimum balance to generate requirements, while allowing fixed-lot sizing and direct inquiry of MRP requirements.

The MRP module includes maintenance of a master production schedule, which can be used to generate requirements for future production.

The module also has the ability to operate in either net change or regenera-

tive mode, and it has a self-correcting feature for errors, the spokesman noted.

Work Order Status

The work order status routines maintain a data base of all open, release or completed work orders. They also provide a capacity planning and loading capability and generate more than 20 reports, he said.

The full package costs \$23,750 for a first license and \$6,250 to \$10,000 for packages purchased separately. Subsequent licenses are available at a substantial discount, Compusource said from 21735 S. Western Ave., Torrance, Calif. 90501.

'Software Management System' Works With CDC 38500

MINNEAPOLIS — A software utility system, introduced by Control Data Corp. for its 38500 mass storage system, was designed to manage data sets automatically in a hierarchical information storage environment.

CDC's Storage Management System (SMS) provides automatic migration and backup of disk data sets to mass storage and from mass storage to magnetic tape under predefined, user-specified criteria, a spokesman stated. These criteria can include such elements as data set name, data of last use or file update.

SMS reportedly can reduce the amount of computer processing time organizations take to back up their disk data storage with magnetic tape.

The software backs up only those data sets in which recorded information has changed. This way a user doesn't have to copy an entire disk pack to tape in order to record the changed data, the spokesman noted.

The package operates under Release 2.1 of the firm's virtual Data Set Access Method (Vdam) software and includes support for IBM's Time Sharing Option (TSO) as well as support for both Isam and Vsam data sets.

The software can be obtained for a paid-up license charge of \$20,000 or on a lease basis for an initial fee of \$3,000 and a monthly royalty charge of \$600. Maintenance charges are \$100/mo. CDC is at 8100 S. 34th St., Minneapolis, Minn. 55440.

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Problem Posed By Definition Of Data Base

(Continued from Page 39)

- Facilitates multiple views of the same data, i.e., various access paths. Contains multiple records or segments within the same data set.
- Has clearly defined data and relationships, particularly when recorded under a data dictionary or directory.
- Is directly accessible.
- Is on-line and can be updated on-line.
- Provides simplified access to highly structured data.
- Is expandable both physically and logically.
- Facilitates ad hoc reporting.
- Has little data redundancy and high data integrity.
- Has high data independence — programs are independent of the physical storage and relative location of records, segments and fields.
- Is centrally controlled as to content, security, integrity and standards.

This list, while certainly not exhaustive and not a general endorsement, may help someone, someday, identify something that approaches a data base.

Fennelly is with the data base administration function at Blue Cross/Blue Shield of New Jersey.

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Itel's DISCERN is the most efficient and comprehensive VS1 performance monitor available. Not only does it provide sampling features to tell you exactly how your system is performing at any given moment, but DISCERN also offers tracing features that allow certain hardware and software functions to be monitored over a period of time. And DISCERN lets you choose which events will be sampled or traced. So you have an up-to-the-minute report on only those facts that interest you.

Fifteen different reports provide information on the operation of both hardware functions and operating system performance. The method whereby certain events are traced (as opposed to statistical sampling) provides two reports that are unique in their accuracy:

- ☐ 3270 Response Times — a list of response statistics for locally attached 3277 devices;
- ☐ ENQ/DEQ Activity — a description of the true duration and wait time of ENQ/DEQ combinations.

By pinpointing bottlenecks, DISCERN aids in tuning your VS1 system to its maximum

capability. And DISCERN uses a very small portion of your CPU cycles, making it one of the most economical monitors.

Compatible with all VS1 releases, DISCERN uses only 12K bytes of real storage to run the monitor program. A wide range of control options provide flexibility in producing only those reports of interest to the user, which saves both time and CPU overhead.

Itel supports DISCERN with total service capabilities, from 24-hour worldwide maintenance, to the development of new products and enhancements for existing ones.

Like all Itel program products, DISCERN is backed by the same kind of full service support that has helped establish Itel's reputation for quality and professionalism in the data processing industry.

For further information, call your local Itel office and ask for a Program Products Representative or contact Itel Corporation, Program Products, 1801 Page Mill Road, Palo Alto, California 94304, (800) 227-8425. Within California (415) 494-3338.

ITEL

MIS Gives On-Line Access to College Data

(Continued from Page 37)

Corp. B4800 computer — was designed primarily to give college administrators and instructors faster and easier access to information. Faster access can eventually cut operational costs and improve the overall quality of student education, according to Brevard controller Stephen J. Megregian.

"The concept of accountability is sweeping the country," the college official stated. "Today we are asked to provide more facts, statistics and information than ever before." And, "since smaller colleges have to produce the same number and quality of reports as big schools with much larger staffs, the workload can be a problem."

Designed by Brevard, the management information system serves more

than 8,500 full-time students enrolled in the Cocoa-based college as well as the nearly 7,000 full-time students in the other two schools. Continuing education students and seminar attendees are also tracked by the administrative computer program.

Five-Minute Registration

Brevard's system includes an on-line registration routine that enables most students to register in five minutes or less. A financial program provides officials with daily information on bank allowances and available funds. The computer equipment for the system also supports a Brevard computer science program, serving nearly 600 students each term, Megregian pointed out.

The Burroughs operating software enables the school to run numerous applications programs simultaneously in a data communications environment, William O. Angel, director of data services, explained.

"Programs related to student records were the first to be brought on-line, since almost every college office needs to access these records. Since the ultimate objective was an interactive student records financial system, it also made sense to start with students who account for 99% of Brevard's accounts receivable transactions," Angel recalled.

Reign of Disorder

With the previous batch method of processing student records, "if there were 25 seats in a class, we punched 25 cards," Angel continued. "But students often threw away cards. Other cards were misplaced or lost in transit between registration areas and data processing, so class rolls were inaccurate and classes were over- and underfilled. Schedule changes were cumbersome and fee calculations — figured by hand — were frequently wrong."

"Often, we wouldn't discover uncollected lab fees until mid-term, and then our chances of collecting the money were poor," the data services director said.

"The old system required a large registration staff," he added. "On each campus, we needed one person at the entrance to screen out students with outstanding parking tickets and so forth, who were listed in our files. Another staffer calculated fees by hand. There were so many registration stations involved that some students spent up to eight hours in lines."

On-line registration has eliminated these problems. Now, students come at preassigned registration times and seldom spend more than five minutes signing up for courses. New students can register for classes at the same time they apply for admission.

Tuition and fees are calculated on-line by the B4800 system and, at day's end, are posted automatically to the general ledger. Angel said this eliminates out-of-balance adjustments and assures the college that calculations are accurate.

Screening Registrants

Another feature of the on-line program eliminates the need for screening registrants. If a student has an unresolved problem — a parking fine, a bad check, questionable residency and so on — the information is entered in the

computer, which is programmed to print out a postcard informing the student of the problem. The computer then puts a freeze on the student's records so that no new class schedules can be entered or grades issued until the problem is resolved.

Brevard's interactive on-line financial package includes purchasing, accounts receivable and payable, payroll, personnel, automatic bank reconciliation and general ledger. According to Megregian, Brevard opted for a slightly different approach to financial program development.

Financial officers need a daily business picture, and that's what our system provides. Accounting transactions are entered through on-line terminals which results in immediate edit input, and the data is then posted each night in an off-line environment. This type of financial system is much easier and less expensive to develop than an instant update system," he said.

With the old financial programs, the college's controller, budget custodians and board received financial reports from the 10th to the 15th of a month for the previous month. Information was always an average of 20 days old, Brevard's controller noted.

"I had to keep our bank balances high because I didn't know when I would need the money to meet commitments. Now, I know how much money I need in the bank every day."

"I can project expenditures and time them to coincide with cash peaks, and I can buy longer term, higher yield in-

vestments rather than always settling for short-term ones. That can mean a substantial amount of income to a school," Megregian said.

The software's on-line purchasing system, a part of the financial package, allows vendor files to be accessed or created in a real-time mode. Purchase orders are developed and then automatically printed on a Burroughs TC 4000 printer terminal.

Eliminates Coding, Waiting

The academic/administrative system also supports on-line programming, which reportedly eliminates coding and waiting for programs to be key-punched and compiled. It incorporates an alumni tracking system that keeps computerized tables on former students for at least 10 years after graduation.

"The Florida Education Computing Project is an outgrowth of the district equalization movement that distributes funds so that districts that collect less in property taxes can provide residents with the same quality of education as richer districts," Megregian said.

"In a similar spirit, the computing project makes funds available to schools to develop joint utilization computer programs. Now, although Lake City and Central Florida Community Colleges do not have the facilities to develop their own on-line systems, they can enjoy the same benefits as Brevard without an increase in DP costs."

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'Data Master' Backs Non-DPer on DG Systems

COSTA MESA, Calif. — Data Master, an interactive, parameter-driven data entry system from Applied Business Systems, enables nonprogrammers to work effectively on Data General Corp. Novas

or Eclipses running under RDOs with multiuser Extended Basic, according to a spokesman.

The system allows any user to specify the structure of a file and then to format the CRT screen to accept and edit the file information as it is entered.

Data Master not only provides the nonprogrammer with the ability to design and maintain his own data base, it

also becomes a significant programming aid for DP professionals who must respond quickly to the requirements of organizations they support, the spokesman asserted.

The software provides the classic file maintenance capabilities of adding, deleting and changing items in any of the files, as well as making inquiries about them or listing them, he continued. User-defined CRT screen prompts

and data entry formatting are also part of the system.

As many as three screen "pages" can be created for a single record, the company noted. Editing of data entered is triggered by specific user-defined criteria, including — if desired — such things as range checking and validation of type of information represented.

The system was designed to run on any 64K-byte or larger

Nova or Eclipse with a disk subsystem, a CRT and a printer running under mapped or unmapped RDOs.

End users can acquire Data Master for \$1,250. OEMs can acquire the software for multiple CPUs for a one-time fee of \$2,000.

An optional support contract is available for \$125/year, the vendor said from Suite B-6, 3303 Harbor Blvd., Costa Mesa, Calif. 92626.

'Socko' Eases OS Debugs

PAWNEE, Ill. — The Socko program exception monitor from Illini Software Co. is a tool for the applications programmer involved in debugging new or revised programs in IBM OS or OS/VS environments.

In operation, Socko intercepts all SOCx-type program exceptions which normally lead to Abends and memory dumps, captures necessary debugging data and resumes program execution. The end result, according to Illini, is fewer test runs, a shorter test phase and less use of computer resources.

Socko is easy to use and control, a spokesman said. Simple JCL changes activate and control use of the monitor. The display of the Abend conditions are easily read and are very relevant to the debugging effort, he asserted.

The programmer controls how many exceptions to allow and the core dump options.

Distributed in assembler source code, the monitor is available under a perpetual license for \$1,100, the spokesman said. The company can be reached through P.O. Box 684, Pawnee, Ill. 62558.

GMA Boosts CICS Aid

CHICAGO — Qwik-Screen, a productivity aid introduced by GMA Software for creating CICS maps on-line, has been enhanced to operate in all DOS, OS or VS CICS environments in a pseudo-conversational mode.

Programmers create maps by keying in their output pictures on an IBM 3270 terminal, inserting attribute designators to define each field of the map. The software displays each defined field, requesting a data name and the actual attribute value from which it generates the macros.

After all the fields have been processed, the macros for both Maps and Dsects are generated for the assembler, Cobol or PL/I language as specified by the programmer.

Composed of both a mapping and CICS I/O interface modules, Qwik-Screen is available for a one-time license fee of \$1,495 from GMA Software at 2946 N. Merrimac Ave., Chicago, Ill. 60634.

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Package Tracks Special Features Inventory Maintained for Garment Makers

MANLIUS, N.Y. — Manlius Valley Enterprises, Inc. has unveiled a software package for men's clothing manufacturers that can not only create and maintain a materials inventory file, but can also keep track of special garment features and manufacturing requirements.

The package requires a minimum 32K characters of main

memory as well as a pair of floppy disk drives with a minimum total storage capacity of 512K characters, a 132-column printer and a keyboard entry device.

The system, written in Basic, monitors each lot of material and individual pieces while building an informational file, a spokesman said. The file includes information on the

warehouse location of each piece of material, the length remaining in each piece, the number of pieces in each lot, the original length before shrinking, the width and the material's shrunken length.

The cutting allowance required because of the material's characteristics, the identification of the related linings and buttons used with

the material, the owner of the goods and the orders on which the pieces were used are also included in the file.

Model File Created

In addition, the system creates and maintains a model file that describes each garment and can be modified with production variables when orders are entered, the spokesman

stated.

Using both the inventory and modeling data, the software generates cutting tickets detailing the number of layers of cloth that can be cut accurately. The cutting criteria can be adjusted by the operator during the processing of the order, the spokesman added.

Finally, the software produces summary reports for each production order that can be forwarded to various departments for production scheduling and control as well as accounting and shipping.

The clothing system sells for \$4,000 under a perpetual license from Manlius Valley Enterprises, P.O. Box 232, Manlius, N.Y. 13104.

Aid Manages Table Files

TAMPA, Fla. — American Software and Computer Services, Inc. (ASCS) has introduced a table file management program for Burroughs Corp. B80, B800 and NCR Corp. 8200 computers that is said to cut software development time and eliminate the need for the constant revision of programs.

The table file package eliminates the need for creating and maintaining programs for files consisting of an index or key and a single retrievable field.

In addition, programs do not have to be revised to a great extent since the programs do not have to be altered every time there is a change in the tables, a spokesman said.

The software's initial license fee costs \$495 plus the magnetic media price from ASCS at 5445 Mariner St., Tampa, Fla. 33609.

'Bplot' Runs Under RT-11

LAGUNA NIGUEL, Calif. — Chapman & Associates has introduced a general plotting package written in Basic for the small business user.

Called Bplot, the package can be used on any RT-11 system with Basic in conjunction with a Printronix, Inc. line printer. It will be available on other systems soon, the company noted.

Bplot comes with a user manual that describes its use and discusses useful application areas and how they can be developed, as well as the theory and practice behind each section of Bplot.

Bplot costs \$600 from Chapman & Associates, 29321 Kensington, Laguna Niguel, Calif. 92677.



Bowne Offers Construction Tool With 'Comspec'

NEW YORK — Spectext, a data base of standardized text covering Divisions two through 16 of the Construction Specification Institute (CSI) manual of practice, has been added to the options available on the Comspec automated specification system offered through the remote computing services of Bowne Information Systems.

Both Spectext and Comspec are products of Construction Sciences Research Foundation. Bowne implements Comspec and makes it available nationwide under contract from the foundation.

Described as "concise and imperative," Spectext currently contains 1,500 pages of construction language covering the development of architectural, mechanical and electrical specifications.

cations.

The technical text "reflects the way project specs are being written in the private sector," a spokesman said. All measures appear in both standard English and metric units.

The objective of Spectext-on-Comspec is to permit the writing of a technically and legally accurate specification in the fewest possible words, he continued.

As an automated data base, Spectext-on-Comspec offers the subscriber the option of accessing and using Spectext directly on various word processing devices electronically linked to Bowne's data center here.

A "spec" writer or typist can access sections of text, edit them to fit the specific situation and signal Comspec

to produce edit pages for further review or publishing. Alternatively, the user can call upon Spectext-on-Comspec to do the actual typing and production work, producing the output at a regional Comspec service center.

Bowne Information Systems is at 160 Water St., New York, N.Y. 10038.

Plessey Adapts RSX-11M To Run on LSI-11 Micro

IRVINE, Calif. — Plessey Peripherals Systems has adapted Digital Equipment Corp.'s RSX-11M operating system to run on DEC's micro-based LSI-11 as well as the more conventional PDP-11s. Plessey's LSX-11M is compatible with RSX-11M, supporting 28K bytes of memory and all the peripherals normally backed by that

system, according to a spokesman.

The Plessey software goes beyond DEC's RSX-11S, since it supports all the RSX-11M executive functions and file structures, which are not backed by RSX-11S, he asserted. Only with LSX-11M can programs developed for RSX-11M be run on the LSI-11 and vice versa, the spokesman claimed.

LSX-11M offers a multiuser program development facility as well as a real-time user environment. The system's task scheduling mechanism recognizes 250 priority levels — enough to enable the user to compile, debug and install tasks without affecting real-time task response, he continued.

Tasks can be written in Macro-11 or Fortran IV. An additional feature is a "powerful batch-like" facility, the spokesman said.

LSX-11M is available now under what Plessey calls a Category C license — including media and documentation but no support — for a list price of \$2,330.

Plessey is at 17466 Daimler, Irvine, Calif. 92714.

OPS Managers

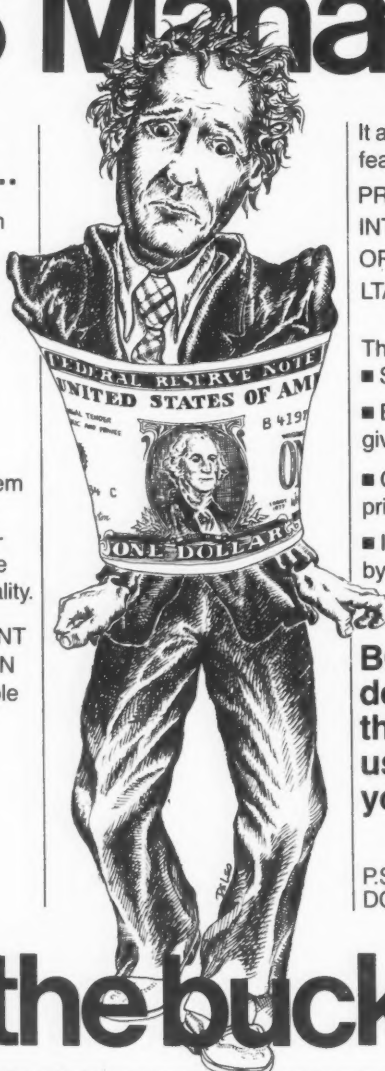
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- Improving system throughput by at least 15% — more if you are a DOC user.

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P.S. Sorry OS users — this is for DOS/VS only.

Bookkeeping Backed on 6502

AURORA, Ohio — Disk-based software for small businesses using the Ohio Scientific Instruments, Inc. 6502 microcomputer provides complete bookkeeping software facilities, including general ledger and billing/invoice, according to the vendor.

Furnished on three 8-in. floppy disks, OS-Amcap can be used on Ohio Scientific machines with at least 48K bytes of random-access memory (RAM) and a dual floppy capability. The software features a self-starting design and incorporates interactive conversational prompts in the language of the end user, a spokesman stated.

Variable Allocations

The software has a variable allocation capability that allows the business user to select the amount of memory space to be reserved for the various working files. Memory space is limited only by disk storage availability, the spokesman noted.

The package's billing/invoicing system will support embedded customer files programs if desired, and the general ledger module can provide a complete chart of accounts, cash receipts/disbursements and accounts balancing. All the modules are fully interactive through a common data base and supply easy-to-read reports, the spokesman claimed.

Developed by American Microprocessor Equipment and Supply, the software costs \$975 from Ohio Scientific at 1333 Chillicothe Road, Aurora, Ohio 44202.

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We will continue to improve and upgrade the MSI product family. Over the next few weeks and months we will be announcing several SIGNIFICANT NEW FEATURES. At that time, these will be made available to existing users.

As with most things in life, no matter how good software is, it can always be enhanced. That's our philosophy — and our customers reap the benefits.

By the way: we view SUPER-MSI as an **alternative** to the original MSI, **not** as an across the board replacement — there are still occasions where MSI might be preferable.

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In a single system (ie., without SHARED DASD), complete integrity is inherently maintained by the operating system. However, with multiple systems, there is nothing to prevent users in different systems from simultaneously modifying the same data or to prevent a user from accessing data which is invalid because it is in the process of being updated from another system.

Remember that possibly hundreds of thousands of operations to shared data occur hourly — so that even a very small probability can result in "many" integrity losses.

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WITHOUT MSI, use of hardware RESERVE is the only sure-fire way to protect data during updates. However, widespread use of RESERVE is precluded for several reasons: it locks out hundreds or thousands of times more data than logically necessary; some update operations, depending on the application, require an entire job to complete (and RESERVE can't open input... if used on even a fraction of the scale necessary to insure comprehensive integrity, RESERVE would undoubtedly quickly lead to "deadly embrace" interlocks. In fact, even the few RESERVEs now used by system components (and a handful of vendor products) seriously degrade your system's performance.

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It is possible to install and start MSI in an active system — providing integrity immediately — in as little as 5 to 10 minutes. This figure does not include the time necessary to absorb the documentation, which we estimate to require an additional 20 minutes.

● **SUPER-MSI TYPICALLY USES LESS THAN 1/8% ADDITIONAL OVERHEAD.**

● **MSI REQUIRES NO ADDITIONAL HARDWARE — YOUR SYSTEM AS IT IS TODAY IS SUFFICIENT.**

● **MSI PROVIDES FEEDBACK ABOUT ITS OWN PERFORMANCE AND BENEFITS.**

MSI includes powerful commands that allow you to measure its performance and benefits, and to suggest ways to tailor it for your environment. For example, MSI will tell you how many times your data would have been in jeopardy without its supervision.

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● **MSI SUPPORTS CONFIGURATIONS CONTAINING ANY MIXTURE OF MVS, SVS, MVT, VS1 AND MFT SYSTEMS.**

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● **MSI HAS A LOT OF HAPPY CUSTOMERS.**

Although MSI has only been available for a few months, it is already installed and enjoyed in nearly 100 installations throughout the world.

* Naturally, you can never know what happened before installing MSI. However, after installing MSI you will know this:

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Utility to Merge Three Nets User Has Big Plans for French Packet Net

By Ronald A. Frank
CW Staff

PARIS — One of the first users on the French Transpac public packet-switched network will be a company that has been preparing for the network since the early 1970s. The net made its formal debut two weeks ago [CW, April 2].

Electricite de France-Gaz de France (EDF-GDF) serves 20 million electric and gas customers on a nationwide basis. It has significant network challenges to keep up with its many communications requirements, according to Nicholas Nahas, chief of the utility's networks.

EDF-GDF now has three separate networks. The RTD network, which began operations in 1972, is basically a message-

switching system operating with 9,600 bit/sec private lines. It connects four major centers which have IBM 370/158 and 370/168 CPUs. Univac 418 communications processors are used for switching, according to Charles Parisot, who is chief of the transmission study group at the utility.

RTD is primarily a remote batch network at whose host sites about 25 Mitra 15 terminals from the French manufacturer Sems are used. Some Univac DCT 2000 terminals are also in use. Applications include billing, file transfer and payroll.

The second major network is called Mercure. A job-oriented system for scientific applications, it utilizes dual IBM 3033 mainframes with Control Data Corp. 3500 processors as front ends. Access from a variety

of terminals is by private lines.

The third network is an on-line CRT-based application for remote management of subscriber accounts. The network includes 400 CRTs which keep track of account data stored at four major DP centers. The centers have IBM 370/148s and a 3031 in Paris, Parisot said. Most of the terminals are Inco-term Corp. SPD 10/20s.

Merger Plans

EDF-GDF began planning in 1972 to merge the three operations. In 1974, when the French postal, telephone and telegraph (PTT) administration announced Transpac, it was decided the packet would provide the transmission facilities.

In the course of planning to intergrade the operations, the utility developed its own protocol compatible with CCITT X.25 and with a three-layered structure much like that of X.25. IBM had not yet announced its Systems Network Architecture (SNA) and X.25 was not yet a standard, but the company probably would have wanted to develop its own architecture anyway so it would not be locked into one system, Nahas noted.

The EDF-GDF architecture, developed in 1976, is called Reseau Teleinformatique National (Retina). It is both SNA- and X.25-compatible and can operate with multiple vendors' equipment without running into compatibility problems, Nahas said.

Now that Transpac is operational, the three

(Continued on Page 50)

Inquiry/Response Terminal Built For Both Datapac, Phone Nets

OTTAWA — The TransCanada Telephone System's (TCTS) Computer Communications Group has unveiled a short inquiry/response terminal that has up to 452 characters of random-access memory, a 16-character LED operator-prompting display and a monthly price tag of less than \$30.

Available in the U.S. through Northern Telecom Ltd., the Vutran transaction terminal has a 20-button keypad with 10 numerics and 10 function keys. It is reportedly compatible with most telephone systems.

The device's memory is partitioned into variable-length fields allowing a maximum of 254 characters for transaction data, 89 characters for protected data and 109 characters for telephone number storage, a spokesman stated.

The system also has an integrated card reader capable of reading the American Bankers Association (ABA) Track II magnetic stripe.

The terminal, which includes an originate-only 300 bit/sec modem with an automatic data mode feature, operates in the store-and-forward and interactive modes. In store-and-forward mode, the transaction is stored in memory off-line and then transmitted to the receiving end after call setup. In the interactive mode, the characters are sent on-line to the data base as they are entered.

The compact terminal can transmit over both Datapac, the Canadian packet-switched network, and regular telephone-switched networks, as well as on a two-point private-line configuration, TCTS said.

Subject to appropriate regulatory approval, the terminal will lease for \$29.50/mo including maintenance. TCTS' Computer Communications Group is at 160 Elgin St., Ottawa, Ont., Canada K1G 3J4.

Maker of Newspaper Systems Presses for Full-Duplex Protocol

WILMINGTON, Mass. — Full-duplex 1,200 bit/sec modems are playing a vital role in the success of the text management and composition systems being supplied to the newspaper and book publishing industry by Dymo Graphic Systems here.

"Half-duplex data transmission is just not practical in our system because reporters and editors operating our remote terminals must communicate with the CPU on an interactive basis in order to perform the necessary editing functions," according to John Rothrock, Dymo product manager.

With full-duplex capabilities, an editor can call up a story, make changes, retransmit the

story and then retrieve it to check the typography and to make certain that the syntax is correct. The editor can even view "soft copy" proof of the entire page in a number of type fonts and sizes prior to committing the copy to typesetting.

Since 300 bit/sec is far too slow for this type of graphics display, the Racal-Vadic, Inc. VA3400 was exactly what the company was looking for — "a reliable, field-proven 1,200 bit/sec full-duplex modem," Rothrock said.

The use of remote editing terminals for sending classified and display advertising,

(Continued on Page 50)

COMMUNICATIONS

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Protocol Impresses Newspaper System Maker

(Continued from Page 49)

news and wire system copy to a central composing room is a great advantage to a modern newspaper. For example, a metropolitan paper can decrease the capital investment in plant equipment by using an independent printer in a lower cost suburban area; a national publication with regional issues can use strategically located composing or printing establishments.

Reporting on Location

The *Sun News* of Myrtle Beach, S.C., makes good use of remote data entry. Reporters use Dymo Model 51 terminals to cover local and state news on location. Stories are transmitted to the composing room at 1,200 bit/sec and then retransmitted to the reporter for

final editing and proofing.

When not being used in a news gathering/editing mode, the Dymo system is used for general business and accounting.

The Dymo text management and composition system can store and retrieve copy data in queues and directories, which are analogous to in/out file baskets.

Once stories are selected, editors can call up and manipulate entire versions and then display them on the graphics display terminal in the soft copy proof mode. The terminal enables operators to compose and display hyphenated and justified copy in representative type fonts and sizes.

The remote copy terminals used in Dymo systems are user-oriented and

include such features as an insert operation; delete word, paragraph and sentence operations; word wrap; block move; store and recall; and scrolling. Advanced multiple video features include blinking of input errors; reverse video of text blocks; strike-through and identifiers of pi characters; and underline indicators for typeface changes.

The terminals have functional keys that provide single keystroke operation, virtually eliminating rekeying of lengthy command sequences. The bottom line of the screen display is devoted to operator communications and system status indications; the reporter or editor can see at a glance what the system is doing at any time.

"Another reason we chose the

VA3400 modems was the positive status indication and the remote testing capability," Rothrock stated. "With these aids we can almost always isolate the problem in a very short period of time, and we usually find that the problem is not the modem."

"There is another reason why 1,200 bit/sec full-duplex is so important to us. Using 300 bit/sec, it took over 14 minutes to download our terminal's memory from the CPU," manager of advanced development Robert Bushkoff said.

"Also, it was extremely error-prone. At 1,200 bit/sec, using Racal-Vadic's full-duplex modem, we reduce the time to only two and one half minutes, with much higher reliability.

"We must have this downloading capability because ours is an intelligent terminal, with the program stored in dynamic memory. Whenever the terminal is turned on, the host computer is instructed to reenter the program. Error checking is done at this time, too."

The company can take a terminal and a VA3400 modem and make a demonstration at the customer's plant by going on-line with the computer at its headquarters. The system can be demonstrated anywhere there is a telephone line.

AJ announces deflation.

We're getting a little tired of costs going up and up. So we decided to start a counter-trend—at least for terminal users.

Now you can lease the AJ 630 thermal teleprinter terminal at a new low price of \$70 a month, *including maintenance*.

And the AJ 830 "daisy" teleprinter terminal for just \$113 a month, also *including maintenance*.

Both have switch-selectable printing speeds up to 30 cps.

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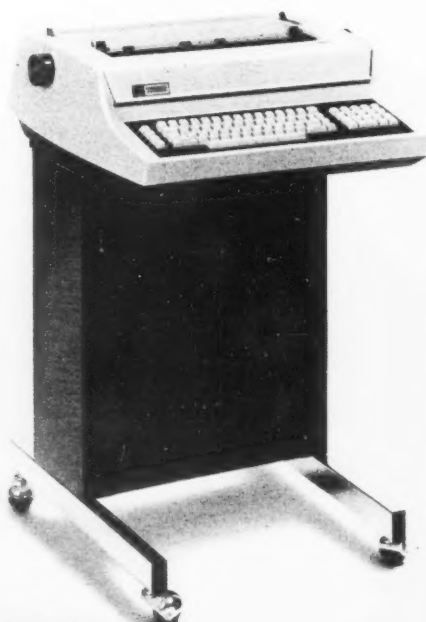
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To get on-line fast at these deflationary lease rates, call Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131, (408) 263-8520. From outside California, call toll-free: (800) 538-9721.

The AJ 830.
A versatile
30 cps "daisy"
printer terminal.
\$113 a month!



ANDERSON JACOBSON

Utility Has Plans For Packet Net

(Continued from Page 49)

nets will ultimately become part of a decentralized approach to communications facilities. EDF-GDF has been testing four nodes on Transpac that may become part of a fully decentralized nationwide network combining the applications now running on the separate nets.

Each of the four test nodes uses Mitra 125 communications processors to implement the Retina protocol. Each node has either an IBM 370/148 or 370/138; Nahas sees no problem in upgrading these CPUs to IBM 4300 series machines if the network is expanded further.

In addition to the Mitra processors, the Retina protocol will be implemented on Level 64/40 or 50 processors from CII-Honeywell Bull so the EDF-GDF network can have the flexibility to draw on two suppliers.

At present, the Mitra 125s interface with IBM 3705s that front-end the IBM mainframes at each site.

The next step in network implementation will be to use the Retina protocol so the Mitra processors can interface directly with the CPU channel. This will eliminate the cost of the 3705s, Parisot said.

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Graham has combined Epoch 4's famous binder system with a new magnetic particle. The result is a more durable and reliable new computer tape—Epoch 480.

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The "Magnum 80" particle is larger than conventional oxide particles, so it disperses more evenly. This helps reduce oxide clumps and the resulting debris caused by the head wearing away at these clumps.

Epoch 480 is more durable than Epoch 4, yet it's every bit as resilient to handling damage, cracking and crazing. This is the smoothest, most durable, cleanest-running tape ever developed by Graham. And like its famous predecessor, every reel of Epoch 480 is 100% certified zero defect.

With Epoch 480 you get the best. Because that's all Graham knows how to make.

When you buy from Graham you deal direct with a Graham magnetic media specialist. We wouldn't have it any other way.



GRAHAM MAGNETICS

Printer by Centronics Runs at 1,200 Bit/Sec

HUDSON, N.H. — A built-in RS-232C serial interface and operator-selectable line protocols are two features of a data communications printer recently introduced by Centronics Data Computer Corp.

The Model 704 has a throughput of 70- to 400 line/min via the printers 180 char./sec print speed.

The unit can sustain a 28-character line length at 1,200 bit/sec, a spokesman stated.

Three Protocols

Three line protocols — XON/XOFF, reverse channel and data terminal ready — as well as parity, stop bits and data transmission rates are switch-selectable.

The switches are located just behind the printer's front panel.

For end-user flexibility, a 9-ft RS-232C cable is standard with the Model 704, and the printer is equipped with a 256-character buffer. The unit also has a 9-pin free-flight print head, described by the company as the first of its kind in a data communications printer.

The print head operates by propelling solenoid-actuated wires against the paper in a near-straight line, enabling the user to utilize different forms thicknesses without adjusting the print head gap, the spokesman explained.

Look-Ahead Viewing

The printer incorporates a bidirectional/logic-seeking operation that, in combination with either the standard or optional memory package, al-

lows look-ahead viewing of buffered data and the elimination of time-consuming carriage returns, he added.

Two-channel downstream loading, forms override, and a bottom/rear tractor paper feed are also standard on the Model 704.

The basic printer is priced at \$2,350 from Centronics at 1 Wall St., Hudson, N.H. 03051.

TI Units Get Character Mapping

HOUSTON — Texas Instruments, Inc. has introduced a character mapping option for its Silent 700 models 763 and 765 bubble memory terminals. The option is said to assist IBM users whose systems already have telecommunications and currently use the Time Sharing Option (TSO).

The character mapping feature reportedly provides the benefits of batch input without system modification by providing a method to substitute characters sent by a computer. Previously, users had to modify their systems software for all control and special characters to communicate data to TI's, a

spokesman explained.

The character mapping option translates characters while the data is enroute to the host system and performs the same duties when the information is being sent back to the terminal. The option is useful in TSO applications or in other systems where Ascii characters have unique control or special functions.

The option is priced at \$50. It is available on current 763 and 765 terminals or can be field-installed on existing systems.

TI is located at 9777 W. Gulfbank Drive, Houston, Texas 77001.

INTRODUCING THE PERKIN-ELMER 3220

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Architecture	16-bit	16-bit	32-bit	32-bit	32-bit
DMA Bandwidth	2MB	6MB	8MB	26MB	2.5MB
Maximum Memory	256KB	256KB	4MB	1.87MB	2MB
Number of Registers	8	16	128	8	128
Direct Addressing	56KB	56KB	4MB	.5MB	32MB (virtual)
Writable Control Store	No	Yes (opt.)	Yes (opt.)	Yes (opt.)	No
Shared Memory Support	No	No	Yes (opt.)	Yes (opt.)	No
Pricing — Processor 256KB, PF/AP, Systems Console, Chassis and Cabinet	\$29,700	\$41,900	\$33,500	\$41,600	\$70,000
256KB Expansion Memory	N/A	N/A	\$10,000	\$12,500	\$15,000

	Optimizer Technology	Average Compile Time	Whetstone Benchmark	Matrix Inversion Program	Binary Search	Price *
3220 FORTRAN VII	Global	2000 LPM	2.25 Sec.†	3300 Sec.†	39 Sec.†	\$ 88,800
VAX FORTRAN IV Plus	Block	1300 LPM	.85 Sec.	3700 Sec.	109 Sec.	\$167,200

*Both 3220 and VAX configured with: 512KB, Floating Point, 10MB Disk, Dual Density Tape, OS, FORTRAN.

†Without cache memory option.

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PE Has Intelligent Terminal for System Builders

RANDOLPH, N.J. Perkin-Elmer Corp.'s (PE) Terminals Division has announced an intelligent terminal station designed for OEM system builders that features an independent CRT display, keyboard and mass storage modules.

The Model 3500 includes a 12-in. CRT, detachable keyboard, dual floppy disks with up to 160K bytes of storage, 48K bytes of random-access memory expandable in 16K-

byte increments, the read-only memory-based PE Terminal Operating System (Petos) and two expansion cards slots with power, a spokesman said.

Each floppy disk drive has its own direct memory access (DMA) channel and controller. An integral high-performance I/O processor permits interfacing with workstation-related hardware, such as bar code readers or optical character recognition wands.

Petos, a multitasking disk operating system, provides "plain English" communications. A message interception feature lets the system builder turn system messages into application-specific messages for the noncomputer-sophisticated operator, the spokesman noted.

The software also includes device independence and overlapped I/O and a file management system with direct

and sequential file access methods, automatic file expansion and the ability to handle both fixed and variable-record lengths.

A Command Substitution System permits single-command call-up of files of frequently used Petos command sequences.

A set of utility programs containing a copy, debugger, disk directory, task generator, dump, disk backup and verify

and hardware diagnostics is also built into the software package.

Optional hardware modules provide a stop-on-address capability and can store previous processor memory references. In addition, IBM 3780 and 3275 and teletype-writer emulators in both single and multidrop configurations are offered.

The standard Model 3500 with dual floppies is priced at \$6,242; a downloaded version without the disk drives costs \$4,680. Quantity discounts are available from PE's Terminal Division at Randolph Park West, Rte 10 and Emery Ave., Randolph, N.J. 07801.

Dynamic 32-Bit Software, Perkin-Elmer Quality.

The software available for the Model 3220 is exactly what you'd expect from Perkin-Elmer, a company whose reputation was built on quality products. It's true 32-bit software, tuned and proven where it counts: in the field. And not just for months. For years.

Powerful software like our FORTRAN VII, it's targeted to ANSI FORTRAN-77 and IBM FORTRAN H compatibility to reduce conversion costs.

A flexible operating system for event-driven, real-time applications. Program development with up to 32 on-line, interactive terminals. The industry's most advanced transaction processing monitor, supporting commercial applications with up to 64 terminals, using COBOL and SORT/MERGE II.

Shareable software that allows our OS/32 MTM to make multi-terminal, multi-task program development a snap. And, increases memory efficiency as well.

From the Inventors of the 32-bit Supermini.

Five years ago we introduced the first 32-bit supermini, when we were known as Interdata. Now we are the Computer Systems Division of Perkin-Elmer, a Fortune 500 company respected for 40 years for the reliability and performance of its high-technology products. Today we have more than 2000 successful 32-bit installations worldwide.

The Model 3220 is our first product to be introduced and marketed entirely under the name Perkin-Elmer. The 3220 leads off our new Series 3200, with more to come. A compatible family, based on advanced systems and software, the Perkin-Elmer Series 3200 is the next generation of 32-bit superminis. Perkin-Elmer remains the undisputed leader in 32-bit performance and price.

Find out how we've got them beat any way you look at it.

Call or write for a demonstration today. Perkin-Elmer, 2 Crescent Place, Oceanport, NJ 07757. (800) 631-2154. Or, in New Jersey (201) 229-8800.

PERKIN-ELMER

Teller Terminal From NCR Offers Two Printers

DAYTON, Ohio — Designed for savings and loan associations, credit unions and mutual savings banks, NCR Corp.'s general-purpose microprocessor-based teller terminal features two printing systems and a step-by-step instructional transaction format.

The Model 2270 can communicate with NCR mainframes as well as non-NCR equipment via an optional communications module. It can also function as a stand-alone system.

Each terminal maintains separate transaction records for up to four tellers and performs all of the various banking functions, including deposits, withdrawals, inquiries, mortgage and installment loans payments and utility payments, a spokesman stated.

Under program control, the terminal also leads tellers through a variety of transaction procedures via instructions appearing on the system's CRT screen.

The system has both a 40-column printer for journal tapes or document validation and a 90-column printer for pass books and wider forms, the spokesman added.

The price of the system starts at \$10,650. Deliveries are scheduled in the third quarter of this year from NCR at 5. Paterson Blvd., Dayton, Ohio 45409.

ALERT

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Washington University Keeps Lid on RJE Cost

Special to CW
ST. LOUIS — To keep up with an increasing amount of administrative and academic data traffic and still keep a lid on overall DP costs, Washington University here recently updated its computer center by adding a few extra disk drives, more memory and a number of communications-tracking terminal controllers.

The Computing Facilities Center serves all schools

within the university. In the administrative area, the center supports applications for accounting, billing, payroll, physical plant, admissions, student information and alumni records.

In the academic area, the center supports institutional and research applications in such fields as medicine, psychiatry and engineering.

The Computing Facilities Center runs an open shop, 24

hours a day, seven days a week. Students, faculty and administrators can sign on to the system with a proper account number, running batch, interactive and data base applications.

Currently, the center runs 44 different applications systems at the university.

"The keys to the services we offer are decentralization and flexibility," according to Assistant Vice-Chancellor Robert J.

Bensen. "We want the users to have systems that respond to their own particular needs, systems that can be run when and where they are needed."

RJE, CRT Terminals

Most of the jobs are therefore run through 13 remote job entry (RJE) and 80 CRT terminals. Six of the RJE stations, which are used for batch applications and which function as distribution centers for

hard-copy printouts, are in administrative offices, including the medical school and the controller's office. The remainder are in academic areas in the various schools and departments.

The CRT terminals are spread throughout the university. They offer access to data base administration applications, time-sharing applications and text-editing applications.

There also are numerous minicomputer satellite systems, some of which the Computing Facilities Center operates and some of which the departments themselves operate. Computernet, for example, is a system of linked minicomputers, each connected by coaxial cable to a central control minicomputer and, ultimately, to the mainframes.

Each remote minicomputer functions as though it has a large disk drive; in reality, however, each uses the disk storage units connected to the mainframes.

The center has two computers: an IBM 370/145 and a 360/65, which share access to all peripherals. The center also oversees 15 to 20 dedicated minicomputer systems in the medical, engineering and other departments.

The mainframe configuration includes three strings of Memorex Corp. 3670 and 3675 disk storage subsystems. In all, the center has 16 100M-byte 3670 spindles and six 200M-byte 3675 spindles.

Terminal Control

At the same time the center received the first of the 3670s in 1973, it also acquired a Memorex 1270 terminal control unit. This controller, which automatically recognizes a terminal line speed and adapts to it, accommodates a wide range of Ascii, BCD, Ebcdic and other codes. The center recently acquired a second 1270.

"We had considered getting intelligent front ends, but we decided on an additional 1270 because of its price/performance and reliability," Benson said. "Right now we've got 64 lines going into each of the controllers."

The Model 145 mainframe originally had 256K bytes of storage, but the center upgraded it with 1M of Memorex 6400 semiconductor memory.

"We have been in the practice of purchasing used IBM equipment in a minimum configuration and then expanding to our needs with Memorex equipment. We chose the 6400 memory not only because it simplified maintenance to stay with one vendor for storage, but also because of its good product design," Benson said.

THE OBVIOUS ANSWER WON'T HELP YOU.

On one hand, you have a terminal, a processor, or a communications control processor. On the other, you have a few thousand miles of telephone wire, circa 1940. The obvious answer is to install a conventional modem, and hope for the best. It's obvious. And it won't help much. At General DataComm, we go beyond the obvious. With the MP 208 B/A microprocessor based modem.

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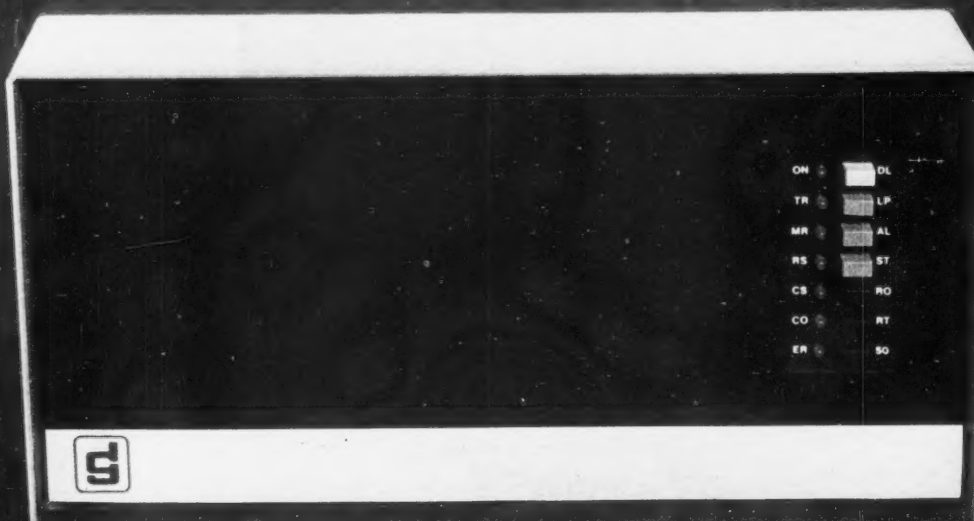
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Model 204 DBMS

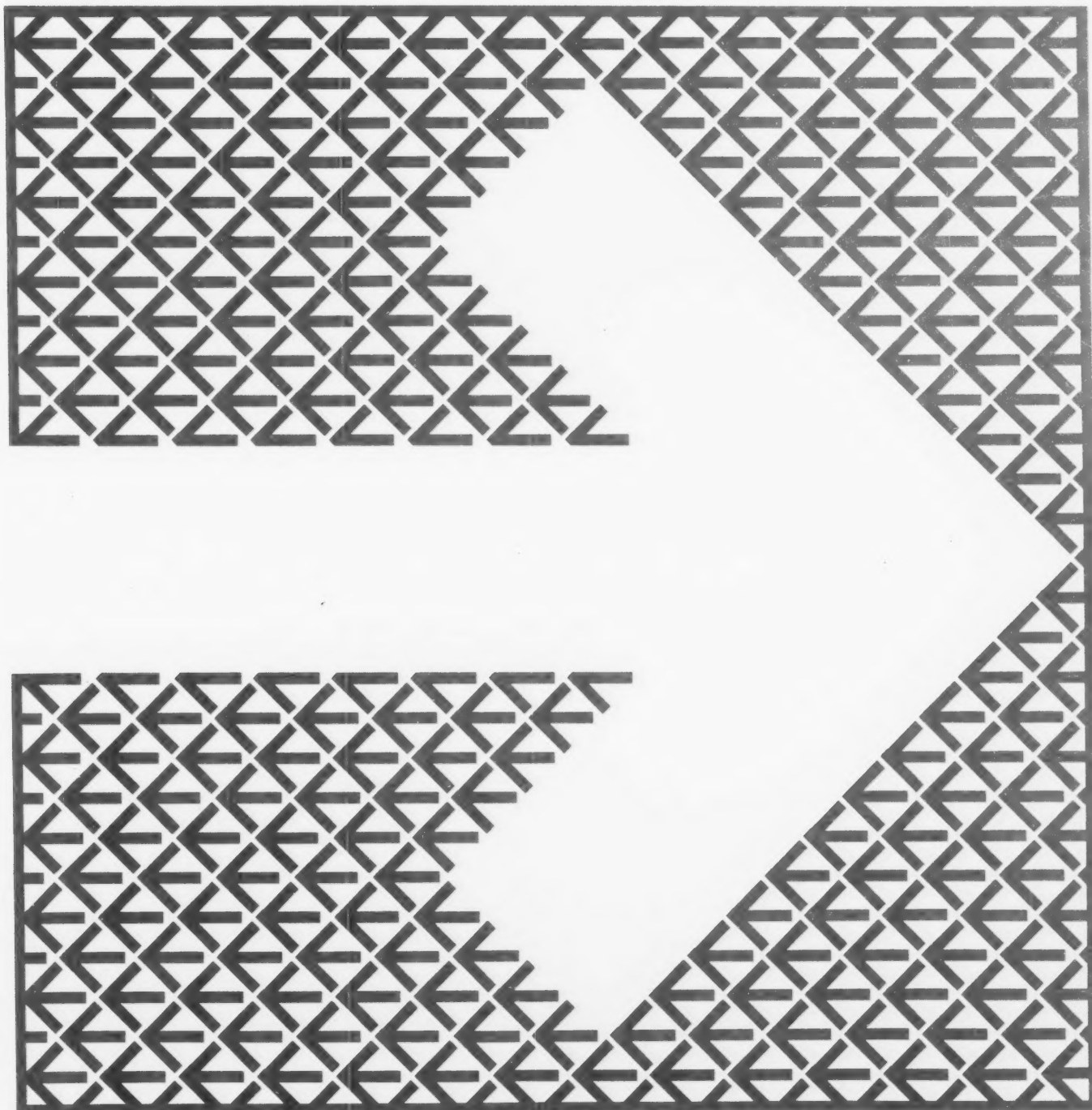
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Our unequalled data independence makes any modification quick and simple. And our high-level user language holds your development time to a minimum.

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BECAUSE MANAGING DATA MEANS MANAGING CHANGE

Computer Corporation of America

Low-Cost Impact Printer Based on Micro

NATICK, Mass. — An impact printer for less than \$1,000 that offers communications and other users software-selectable character density, adjustable forms width and upper and lower case Ascii alphanumeric sets is available from Integral Data Systems, Inc.

Forms control with eight standard forms lengths, both 80- line/in. and 132-column formats and a choice of 6 or 8 line/in. vertical spacing also come with the Model 440 Paper Tiger.

Other features include automatic multiline buffering, stepper-motor paper feed to ensure fast and reliable paper movement and an automatic relinking mechanism to extend ribbon life, the vendor claimed.

An RS-232C serial interface

and a parallel interface compatible with Centronics Data Computer Corp. peripherals are available with the printer, which is reportedly capable of switch-selectable transmission speeds in the 1100 to 1,200-bit/sec range.

An optional 2K-byte buffer/graphics package provides a full dot-plotting graphics ability, while a larger 2K-byte buffer holds a 1,920-character CRT, Integral Data added.

The variable character density feature permits program-controlled highlighting and formatting of copy, the vendor continued. The size of even a single character can reportedly be controlled.

At a small character size setting, up to 132 col/line can be printed on paper 8-in wide. "When using enhanced mode characters, the Paper Tiger

employs a novel method of character formation that smooths out character diagonals, curves and intersections, providing legibility not normally found on matrix printers," a spokesman claimed.

Operator conveniences were said to include automatically incremented forms alignment, perforation, skipping and adjustable pin feed tractors that permit a forms width range of 1.75- to 9. in.

Weighing less than 20 pounds, the Model 440 uses ordinary paper, rather than requiring thermal or electro-



Model 440 Paper Tiger

sensitive stock. With internally held roll paper or 9.5-by 11-in. fanfold forms, both printer and forms require less than 1.75 sq ft of desk space,

the spokesman stated.

To optimize throughput, the Paper Tiger automatically senses the end of each print line, the spokesman said. The unit achieves throughput rates of 42- to more than 300 line/min, depending on line length.

The optional graphics feature allows the user to manipulate every matrix dot on the printed page according to the spokesman. A full range of graphics — from bar codes and block letters to complex illustrations — can thus be printed.

The Paper Tiger costs \$995 from Integral Data at 14 Tech Circle, Natick, Mass. 01760.

Gandalf Option Lets PACX User Get Any of 63 Service Classes

WHEELING, Ill. — Designed as a field-upgradable plug-in option for Gandalf Data, Inc.'s Private Automatic Computer Exchange (PACX), the Keyboard Class Select/Statistics Output (KCS/SO) system allows users to enter commands into PACX via a control terminal keyboard or other data-handling device.

PACX systems electronically connect a large number of terminals having various service requirements to a smaller number of computer ports capable of supporting the required services.

By incorporating the KCS/SO option into existing PACX systems, the user can request a specific class of service (of 63 available classes) from the keyboard by entering the digits or code from the terminal keyboard, a spokesman explained.

Commands to find the port status of port address, to disable a specific port or to change a port class, for example, can be entered into the exchange

system through the user's terminal. The system also monitors PACX operation and provides statistical data regarding all connections, disconnections, unsuccessful attempts and status of any ports, all accompanied by the time of day, the spokesman noted.

The PACX option accepts all Ascii-coded terminals with asynchronous operational speeds of 75-, 110-, 150-, 200-, 300-, 600-, 1,200-,

1,800-, 2,400-, 4,800-, and 9,600 bit/sec.

It also accepts 134.5 bit/sec IBM Model 2741 terminals using BCD, Ebcidic or correspondence codes as well as 300 bit/sec terminals using Ebcidic or correspondence codes.

The KCS/SO option, added to existing PACX 2 systems, costs \$3,600 from Gandalf at 190 Shepard Ave., Wheeling, Ill. 60090.

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Card Users Gain Hand-Fed Readers

FRAZER, Pa. — Cardmation Co. has introduced two hand-fed card readers that read mark sense or card punched data on 80-column tabulating cards for communications and other applications.

The HF-10 series allows entry of data for users of small systems, microcomputers and communication terminals.

Along with its ability to read 29-, 51- or 80-column punched or marked cards, the HF-10 can also process longer tabulating cards appropriate for educational or special applications. The units can be hand-wired or connected to a communications facility via an RS-232 connector.

The prices of the HF-10 readers begin at \$1,150, with a cost of \$500 for OEM version. Cardmation is at 19A Frazer Mall, Frazer, Pa. 19355.

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Can Compete With DDP Users Told Big Systems Here to Stay

By Howard A. Karten
CW Staff

SAN DIEGO — Large-scale and centralized computer systems will be around "for a long time" and will not be supplanted by minicomputers and distributed data processing (DDP), a Univac scientist here predicted recently.

Speaking to users of large-scale Univac equipment at the USE, Inc. spring conference here, Henry L. Apfelbaum, managing scientist for systems technology planning at Univac, said some problems are tackled bet-

ter by large-scale or centralized systems than by smaller or decentralized systems.

Although minicomputers represent Univac's fastest growing product area, the company is still doing a heavy business in large mainframes and has a substantial backlog of business for these systems, he noted.

DDP can serve the needs of its users and makes good use of existing technology. However, the full potential of the idea is not being realized in several areas, notably data base management and technology, he ob-

served.

Decentralized data processing and DDP are two separate concepts that are often not distinguished in the minds of would-be users, Apfelbaum observed. One feature distinguishing the two concepts is data sharing; decentralized processing involves a far lower level of such sharing, he said.

Two integral elements of distributed processing in Univac's view are the ability to store data close to the point at which it will be used and the freedom users have from caring about where data is physically stored.

Four features will distinguish the DDP effort of the future, Apfelbaum asserted: data storage, control, program development, and operating policy.

Data will be stored close to the point of greatest use, and users "will be insensitive to the location of the data," he predicted. This implies that multiple copies of the same data base may become available — an attractive and realistic possibility, Apfelbaum claimed.

"Control lines will be distributed along organizational lines rather than physical topology," he forecast. In addition, program development will not necessarily be centralized. The organization will develop programs in the way that is most comfortable for it, he indicated.

Finally, the capabilities of future DDP systems will allow them to attend to the details of data distribution, data definition, integrity and recovery as long as policy is set and followed by the managers of the system.

Researcher Uncovers Formula To Sweeten Generated Music

By Ann Dooley
CW Staff

YORKTOWN HEIGHTS, N.Y. — Composers of computer-generated music may be able to produce more natural melodies because of a discovery that correlates musical notes with the order in which they occur in nature.

The recently discovered "one over f noise" (1/f) is a kind of relationship found in many natural processes. It can be adapted as an important tool generating computer music, according to Dr. Richard F. Voss, a physicist at the IBM Research Center here and the discoverer of the 1/f sequence.

Previously, most computer music consisted of completely random notes or random notes with constraints providing a short-term correlation only. The resulting sounds often lacked melody or were even unpleasant to the listener.

The sounds may have been displeasing because they lacked patterns recognizable to the human ear. It is important to have the right combination of notes to create a pattern of both predictability and surprise, Voss said.

This kind of pattern is found in all music and cultures, but until now has been missing in the random sequence of computer-generated notes.

The 1/f relationship, as described by Voss, corresponds to the way each note in a composition relates to every other note in pitch and loudness. If the notes are random, the sounds are meaningless. If the notes are too

closely correlated, the music sounds predictable and dull.

The 1/f relationship, which Voss discovered while performing research on the statistical properties of electrical circuit noise, can be found throughout nature — in the sounds of such diverse phenomena as electricity, rushing flood waters and expressway traffic, as well as musical compositions ranging from Bach to rock.

The 1/f noises have the same statistical relationship regardless of whether they are observed for a second or a year, according to Voss, who contended this is the reason 1/f sequences are typical in music.

Printer/Plotter Gives Hard Copy Of Tektronix 4000 Screen Image

IRVINE, Calif. — Trilog, Inc. has introduced a printer/plotter that makes a hard copy of the Tektronix, Inc. 4000 screen.

The Trilog T-100G can also be used to plot on-line from a mainframe or print typewriter-quality type at 150 line/min. It also offers dot matrix-quality printing at 250 line/min, the company said.

The printer/plotter, which is a T-100 with an adapter board for use with the Tektronix graphics terminal, can be ordered at either or — optionally — both speeds.

Plot density is 100 dot/in. Copies of the terminal screen can be made in approximately 40 sec on single or multipart forms,

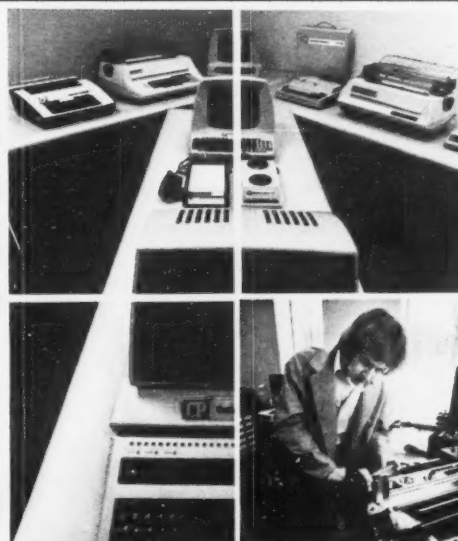
according to a spokesman. A cue feature allows the image from a second CRT to automatically be printed as soon as the first image is completed, he claimed.

The unit plots the image on a standard 14-7/8-in. plain fanfold paper. By using a feature that rotates the image 90°, the rectangular image can also be printed on the smaller, more easily filed and mailed 8.5-by-11-in. format, the spokesman noted.

Existing T-100 printers can be updated to T-100Gs by installing an interface board available for \$975. The T-100G costs \$8,205 from Trilog, 16750 Hale Ave., Irvine, Calif. 92714.

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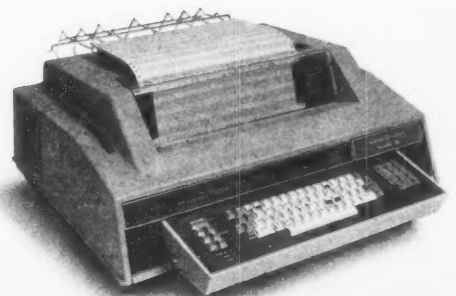
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Manufacturer Hastens Inventory Turnover 33%

By Wilbur J. Allen
Special to CW

ELMIRA, N.Y. — A computer-based inventory system has had a dramatic effect on our manufacturing and financial operations — one year after its installation, we increased turnover nearly 33% and cut stocks by \$500,000.

My company, Powers Manufacturing, Inc., produces quality control inspection equipment for the glass bottling industry. We make 65 different models of 35 basic machines; in addition to custom-manufacturing the equipment, we carry an inventory of all the parts that go into them.

We are a small company. Following our start in 1963 with a few employees and 6,000 square feet, we have grown to a company occupying 75,000 square feet with worldwide marketing operations and more than 100 employees.

Our parts inventory includes about 13,000 items and is worth approximately 15% of our annual sales volume. At that level, inventory is a significant aspect of our operations.

In addition, the company has been growing at a rate of approximately 20% to 25% a year. Like many companies, we discovered that growth does not always come easily, particularly when production relies so heavily on parts inventory. To solve this problem, we initially installed an IBM System/3 Model 10.

The system was used mostly for accounting functions. When we decided to build an order inventory system based on the Model 10, we ran into a lot of problems. For one thing, our growth rate meant inventory data for the previous year was of little value in forecasting.

This and other problems led us to conclude that we needed a different system. Since we were of the opinion that doing it ourself was like reinventing the wheel, we surveyed different vendors to see what hardware and software already existed to perform this task.

Easy Conversion

We finally settled on a Univac 90/30. The system was turned over to us in mid-July 1976, following two weeks of testing by Univac. By Sept. 1 of that year, we had transferred all our existing applications to the Univac system and removed the IBM hardware.

The conversion effort involved about 300 programs, most of which were converted with little or no effort. The new system picked up where the old system left off, performing batch processing of order entry transactions, inventory activity, accounts payable and receivable, labor reporting and standard cost-

ing and purchase price variances.

We began installing Univac's manufacturing system, shortly thereafter. The first module, a bill-of-materials application that became our data base, was operational on Dec. 1, 1976. Other parts of the system were added in due course.

At about the same time, we enclosed the parts storage area, tightening controls over

distribution and receipts of inventory items. We obviously could not have everyone picking parts off the shelves if we hoped to rely on computer records for an accurate count.

The Results

Now for the results:

- We have been able to turn over each item in the inventory 3.8 times vs. 2.9 before we installed the Univac system. We hope to increase this

to 4.5 turnovers of each item in the near future.

- We replaced the tedious physical inventory-taking with weekly cycle counts. We now check inventory every one, three or six months, depending on the part. The computer has been 99% accurate in reporting on-hand stocks.

- We run our standard costing system in 90 minutes vs. the 15 to 17 hours it formerly took. Prepared once a month,

the report shows the cost (including labor) of each machine manufactured. This provides us with cost-of-sales figures.

- We get better information from reports generated by the system. They contain more information and are in a better format.

Allen is manager of materials with Powers Manufacturing, Inc. He was DP manager at the time this system was implemented.

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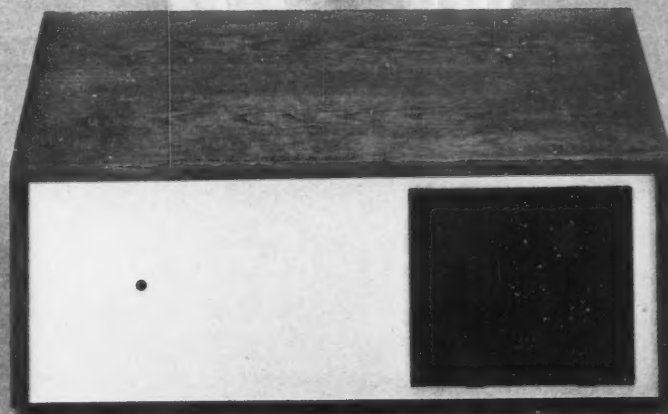
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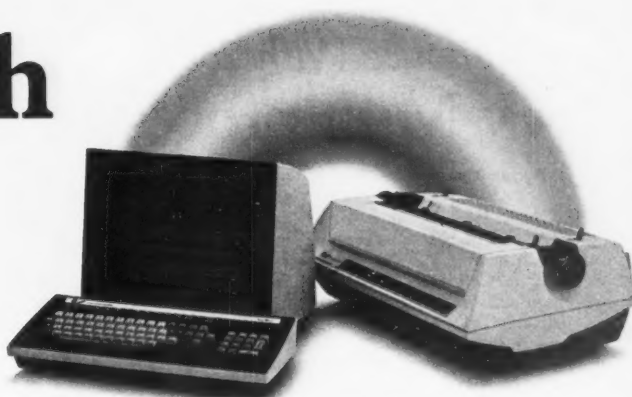
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At Warehouse With 750,000 Items Navy Multiprocessor to Permit Random Storage

By Jay Woodruff

CW Staff

RICHMOND, Va. — The U.S. Navy's Defense Logistics Agency (DLA), which maintains a warehouse of items ranging from spark plugs and transistors to office supplies and toilet paper, will soon move to an automated, random storage system.

The agency expects greater efficiency from the system, which will pinpoint the location of about 750,000 items, making it the single largest mechanized inventory system in the world, according to system planners.

Random allocation of space allows more space utilization than can be

achieved by a traditional dedicated storage system, according to Terence Gregory, senior vice-president for business development at Clay Bernard Systems International (CBSI) of Tulsa, Okla., the systems house responsible for the design.

But, one might wonder, will the military be able to find that set of spark plugs in an emergency if the computer is down? Yes, Gregory said, because CBSI will install a four-processor on-line system that is highly resistant to failure.

Hardware and software are currently in place, but the warehouse will continue to be run manually until July,

when conversion is slated to begin. By July 1980, the depot will be fully automated, Gregory predicted.

Expensive But Necessary

Made up of four Tandem Non-Stop 16 processors from Tandem Computers, Inc. The system can be expanded to as many as 16 processors without reprogramming. It can be serviced as it runs with no effect on system performance, Gregory said.

A multiprocessor is a necessity, but it is also normally an expensive proposition. CBSI used other processors, such as the Data General Corp. Eclipse 200, before looking into the Tandem processors. It concluded that the Tandem systems had the ability to process transactions faster and that a multiple configuration of Tandems was cheaper than processors not specifically designed for transaction processing, Gregory said.

The four processors in the DLA's Depot Integrated Storage and Retrieval System (Disars) have 384K bytes of storage each. Disk storage includes two sets of six disks, each with a capacity of 240M bytes. Each set is a mirror image of the other to provide system redundancy.

The processors are connected to each other by 13M byte/sec dual buses that Tandem calls Dyna buses. Each operates independently of and simultaneously with the other bus so two communications paths are always open between processors, according to Gregory.

Keeping Overhead Low

CPU overhead will also be kept low by downloading warehouse assignments to the facility's 81 intelligent CRT terminals. Twenty-one of the terminals are mounted on picking vehicles driven by human operators.

The vehicles will travel down identically sized aisles that have bin faces rising 25 feet from the warehouse floor. When the terminal gets an order to pick up an item, the vehicle will be guided automatically to the appropriate aisle by wires embedded in the floor. The CRT will display the location of the piece in the bins.

Before loading the piece, the operator will first verify that the right one is picked. The issue order attached to the box should match the number stored in the processors; if it does, the operator will be told to get ahead with the pickup.

While an operator is picking up an item, he will simultaneously unload an item into the space vacated by the picked item, saving the wear and tear of making an extra trip. All orders that the operator picks up will be put onto a conveyor belt to be sent to one of 23 stations in a consolidations area, where they will be packed for shipment.

The weight and size of each item will be known from the time it enters the warehouse receiving area. It will be automatically routed down one of two chutes if it weighs five pounds or less. Heavier items will be sent down the other chute, solving the problem of heavy boxes crushing lighter ones.

To avoid overloading the consolidation area with items for shipment, the picking vehicles' terminals will not get

an order to pick an item until workers in the consolidation area are ready for it. When the Tandem system asks for an item, its weight and size will be indicated so appropriately sized boxes can be made up.

Installation Plans

To ensure that the Disars operation goes smoothly, each part of the system will be exercised after it is installed, then connected to other components and checked for functions, piece by piece, until the entire system is in place, Gregory said.

In addition to stock control, the system will generate a variety of management reports on such things as the amount of activity per aisle, the number of issues and receipts put through the facility in a time period and the percentage of vehicle utilization.

Disars is the latest CBSI installation. The company is installing other automated materials handling systems, including seven at Naval Air Station, North Carolina, Florida, Virginia and Indiana. It will also install one for Xerox Corp. in El Segundo, Calif.

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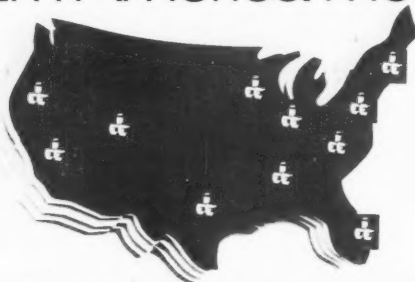
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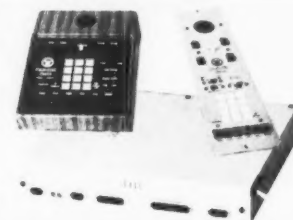
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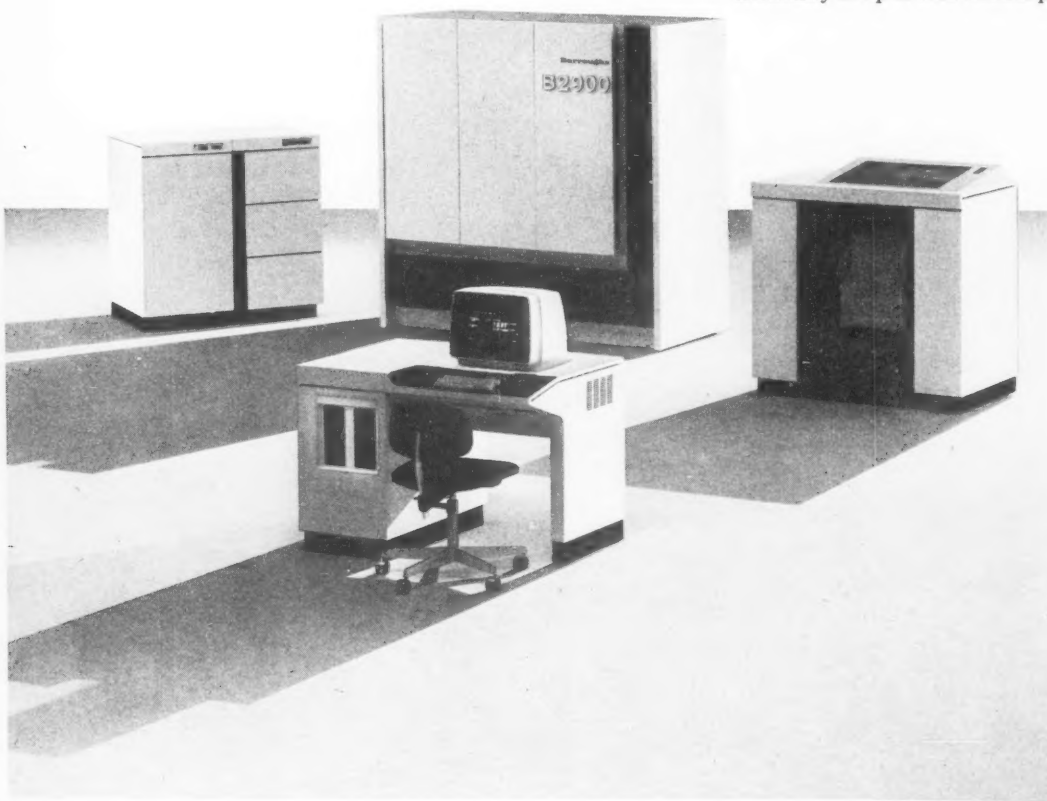
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NEW YORK — Why would a business buy 1,001 thermal printers and pay a premium for them, even with an order that size?

"We're averaging less than one trouble call per year on the entire network, including the modem, printer and telephone line" is one of the reasons, according to Bob Arm-

strong of The Bond Buyer here. A six-month test he supervised convinced Armstrong the printers would have the high reliability the company's clients need for their businesses.

The Bond Buyer, which publishes *The Daily Bond Buyer*, is a wire service that provides data about municipal bonds. Its clients include fi-

nancial analysts who keep printers in their offices to receive the latest bond data.

In such an environment, high reliability, as well as rapid, quiet operation, is essential, Armstrong noted.

"We needed a printer that could print at 120 char./sec. and there aren't too many of those around. Also, the printer is quiet, which is critical in an office environment — beside a bond trader, in most instances, who doesn't want to hear that machine," Armstrong continued. "I've been around the printing business for a long time, and I was stunned by these results."

Before committing itself to such a large order, The Bond Buyer bought one printer, which was used daily for six months in different cities around the country. The results of that heavy field-testing were an important part of the company's decision, Armstrong indicated.

Remote Customers

When the company began business in 1891, customers were largely in the concentrated financial centers around New York and other metropolitan areas, and hand delivery or mail delivery were sufficient to keep customers informed. However, as the financial community expanded throughout the country, the need to have market information rapidly became more acute.

The Bond Buyer's customers were satisfied for years with its daily and weekly publications, but rising demand led officials to consider additional

ways of disseminating data. The immediate outgrowth of that was the creation of a teletypewriter service linking its customers throughout the U.S.

That system, named Munifacts, had the advantage of being able to send information immediately to all subscribers. However, it was limited because bond syndicates with headquarters in financial centers were unable to send private messages to members in scattered locations.

Private Message Capability

After considering alternatives, The Bond Buyer contracted with a software company to design a computerized system with a message division multiplexer to transmit addressable information to selected locations at higher speeds than the teletypewriter. The system, installed in 1975, provided a private message capability to syndicates and their members.

The system is designed around a minicomputer at The Bond Buyer's headquarters, coupled to several terminals used to input messages. A network of private, voice-grade lines provides the telecommunications link.

After some experience with the original printers in that system (whose vendor Armstrong declined to mention), a desire for increased reliability prompted the company to investigate alternatives. That investigation culminated in the purchase of the 1,001 Hewlett-Packard Co. 9866A thermal printers.

The printers operate for a minimum of eight hours a day, five days a week, but require virtually no maintenance, Armstrong indicated. "About every three or four months, operators have to blow the dust out of the filters," he explained, noting that paper changes are the only other reason customers ever had to think about the printers.

"Although these printers were substantially more costly than the original equipment, the increased reliability and customer satisfaction make the investment well worth the added cost," according to Phil Scanlan, national service manager for The Bond Buyer. "The output printer is now one of the strongest links in the Munifacts chain."

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Versatec Upgrades Speed Of Two Printing Devices

SANTA CLARA, Calif. — An upgrade for the Versatec 3200A printer/plotter and the Versatec 3250 printer reportedly increases the speed of those devices from 500- to 1,000 line/min.

The devices can print 64-line pages at a rate of 15 pag/min at that speed, a Versatec spokesman claimed. The upgraded devices are said to offer the fastest printing speed of any 200 dot/in. electrostatic printer.

Designed for use in OEM systems, the 3200A and 3250 print on 11-in.-wide roll paper, 500 ft in length. Eight line/in. and 12.5 char./in. are standard.

Options available with the units include a scientific/-engineering 124-character set and a 128-character typesetting character set.

The upgraded 3200A printer/plotter costs \$11,400; the 3250 printer is priced at \$10,500. Both are available in desktop or rack-mountable version, with OEM discounts available, the spokesman said from 2805 Bowers Ave., Santa Clara, Calif. 95051.

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NCR's KEPLEY:

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Stan Trawick (right) is computer systems manager of Bassett-Walker Knitting Co., Inc., Martinsville, Va. Joe Kepley is an NCR district manager.

our programming staff had no communications background. So we were looking at a period of intensive programmer education. And that would have been followed by another lengthy period devoted to the development of basic communications software. With TRAN-PRO, our staff was able to move through these two stages rapidly and get directly into the application programming.

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Accident Caused Seven Deaths Simulation Graphics Allowed as Trial Evidence

By M. A. Chace
Special to CW

Computer simulation with graphic output can be effective in approximating the circumstances of an accident and conveying that information to a jury. Probably the first such application in a U.S. courtroom occurred last fall in a case involving a collision between a boxcar and a tank car.

The cars were simulated at varying relative speeds until their positions immediately following the simulated collision matched those shown by photographs of the actual damage.

Results of the simulation were output as a succession of detailed pictures on a Tektronix, Inc. 4014 graphics display terminal time-shared to the University of Michigan's Amdahl Corp. 470V/6 computer. Both the graphics display and a film composed of graphics display frames were shown to the court. That form of evidence was justified in legal terms as being "in the nature of a hypothetical question."

Simulation demonstrated a collision speed of about 35 miles per hour, which helped establish railroad liability because the coupling speeds were in excess of those the tank car's design might reasonably be expected to withstand.

Difficult Simulation

The accident occurred at 5 a.m. on July 19, 1974 in the switchyard of the N&W Railroad in Decatur, Ill. No one saw the collision, but evidence suggested an unfortunate coincidence of events culminating in the coupler of the boxcar overriding the tank-car coupler and penetrating the tank car head. That action released the tank car's load of isobutane, known as liquefied petroleum gas (LPG), which subsequently ignited.

Seven persons were killed, and several hundred railroad cars were destroyed. Damages of more than \$20 million were involved. The court's decision essentially placed the entire liability on the railroad as a result of negligence in switching operations.

The crash was difficult to simulate because it involved multiple impacts between several odd-shaped bodies, causing multifreedom, large-displacement response. Limited time was available to develop and validate the date and the simulation model.

However, it was accomplished by use of the Dynamic Response of Articulated Machinery (Dram) program — a self-formulating program designed for that class of problem, but ordinarily used in the computer-aided design of mechanical machinery and vehicles.

Dram, available from Mechanical Dynamics, Inc. of Ann Arbor, Mich., requires as data a minimal definition of the problem, then it develops the ordinary differential equations of motion, integrates them and produces the system response — optionally — as a series of mechanism drawings on a computer graphic display screen.

Either refresh or storage tube output

is available, but storage tube output was used in the courtroom application to obtain greater detail, for reliability

'Both the graphics display and a film composed of graphics display frames were shown to the court. That form of evidence was justified in legal terms as being "in the nature of a hypothetical question."'

and because the storage tube units were more portable than available refresh equipment.

The collision case suggests that computer graphics can be a convincing, high-density means of communicating evidence to a judge or jury. Trust and responsibility are, of course, heavily involved. The program output must ensue from the laws of motion, not from a Walt Disney-like construction.

In addition, the program must be applied with close experimental confirmation of many neighboring problems and on some problems with experimental results similar to the simulated collision.

Chace is a professor of mechanical engineering at the University of Michigan.

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Despite Initial Policy Mistakes Computing Consortium Helps Dutch Cities

By Irvan Berenyi
Special to CW

AMSTERDAM — The Netherlands leads the rest of Europe, and possibly the world, in the development of local government computing, according to Arie Schinkel, founder-director of the Association of Netherlands Municipalities (Soag), the coordinating body for computer development by Dutch municipalities.

But the country's pioneering efforts have been dogged by internal dissension and some unfortunate hardware policy

decisions, he admitted.

"During the 1960s, recognition grew that automation, following its rapid and convincing debut in industry, was bound to find ever-widening applications with government authorities," Schinkel said. "Consequently, Soag established a committee to examine various problems in the field of automation."

"The committee concluded that a national organization for the development of automation systems for use by local authorities — on a cooperative basis — should be created."

Preexisting Consortia

A number of informal computing consortia had already been established by groups of local authorities by 1968, when Soag was set up. The Netherlands has 800 municipalities, few of which could afford the sort of complex data base systems needed by local government on their own.

By 1974, 10 regional computer centers had been set up under Soag control, most of them existing centers handed over by the municipal consortia. By 1976, more than 80% of the Dutch municipalities, representing 93% of the country's population, had joined Soag.

Each of the 10 regional centers was allocated a systems development program appropriate to its expertise. The software was made available on its completion to all the other centers and thus to any municipality that cared to use it.

The systems under development covered the full range of local authority concerns — population, revenues and expenditures, planning, traffic, tourism, recreation, personnel and payroll records, welfare benefits, pensions and cultural activities.

In addition, Schinkel drew up a "hardware realization plan". Soag had inherited an array of incompatible mainframes including International Computers, Ltd. 1900 systems, IBM 360s and 370s, some N.V. Philips Gloeilamp

penfabrieken mainframes and Siemens AG 4004 systems.

Ill-Fated Decisions

The municipalities initially disagreed as to whether Soag should adopt a single-supplier policy or opt for two suppliers. Eventually, a majority decided in favor of sharing purchases between IBM and Unidata consortium, an ill-fated attempt at cooperation by Siemens, Philips and CII, a French company.

Choosing Unidata resulted in a double disaster for Soag. Under government pressure, four centers bought the still-experimental Philips P-1175.

The idea was to help domestic manufacturer Philips pressure Unidata into accepting the P-1175 instead of the profitable P 400 series of small computers into Unidata's range of systems. Unidata rejected the idea, together with Philips' entire P-1000 family, which the Dutch company could no longer afford to develop on its own.

The four Soag centers then ordered Unidata 7000 mainframes to replace the abandoned P-1175s, but only one had been delivered when Unidata itself collapsed. By late 1976, after \$13 million had been spent on it, the project appeared to be on the verge of breaking up.

"Apart from the hardware problems, insufficient progress had been achieved with systems development," Schinkel conceded. "The causes of the delay were the time-consuming consultation procedure and the conflict between users and producers."

"The supervisory groups did not operate as they should have — the members were experts first and prospective users only second. There were too many members, and they were unable to react quickly to changed requirements."

"In addition, not enough attention was paid to the needs of small municipalities, which were different from those of the larger authorities."

Government Intervention

The Dutch government then stepped in and formally took

over, converting it from a body privately owned by the municipalities into a public agency. Day-to-day responsibility for it was placed in the hands of a small steering committee that reports to a larger management board.

"The new Soag gives us the chance to get some order back into the project," Schinkel said. "Now the participants are committed to decisions made by the board, whereas before they continued to give priority to their own regional concerns."

One consequence of the government's takeover was the retention of IBM as sole hardware supplier. Two of the smaller regional centers opted out of Soag in 1976, although both are now reapplying for membership. Of the remain-

ing eight centers, six have IBM 370/148 or 370/158 systems; the other two run Siemens systems.

Two Data Bases

"The operating systems of the two vendors are incompatible, which means there are virtually two sets of data bases," Schinkel observed. "This we aim to correct."

The Soag system has also made an appearance in Yugoslavia, where it is being used as the basis of a national computing service for the seven Yugoslav state governments.

"I go to Yugoslavia each year to help out, but progress is slow," Schinkel observed. "There is none of the cooperation between the different regions that we find in Holland."

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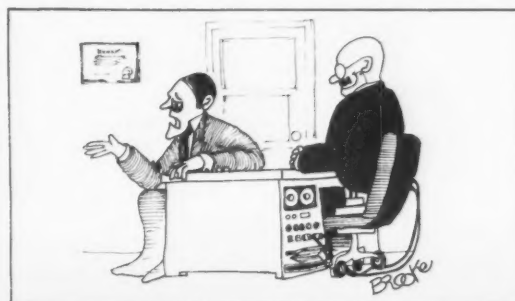
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BOSTON — New England Computer Expo, John B. Hynes Auditorium, (617)262-8000, May 29, 30, 31

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While Lowering Memory Prices DG Extends Main Memories of Eclipses

WESTBORO, Mass. — Data General Corp. has extended main memory capacities for its S/130, S/250 and AP/130 systems and has reduced memory prices on all systems in the Eclipse S series.

Top memory for the S/130 — the smallest Eclipse processor — was raised from 256K to 1M bytes. Top memory for the S/250 high-performance CPU — which uses 128K- and 256K-byte modules — was increased from 1M to 2M bytes.

The memory maximum of DG's entry-level array-processing system, the AP/130, was extended from 192K to 256K bytes, excluding the 8K bytes of bipolar array-processing memory.

The vendor has also lowered the price of Eclipse S memory to \$28,000 per 1M byte. As a result, the 256K-byte S/130 has dropped in price by 27%.

Moreover, the number of memory boards required for that configuration is now three less than

before, while I/O expansion has increased by 75%.

The S/250 system with 512K bytes has likewise dropped 27% in price, to \$44,000. A 1M-byte S/250 configuration now goes for 48% less at \$58,000, a DG spokesman said.

AOS Improvements

Advanced Operating System (AOS) performance "is improved on both S/130 and S/250 systems because of the additional

memory, permitting a greater number of resident programs with a correspondent decrease in disk activity," the spokesman claimed. Configurations of those processors under the Real-Time Disk Operating System (RDOS) are now fully compatible up to 512K-byte memory levels.

The S/130 has become an "ideal entry-level system for budget-constrained users who require future system growth at roughly the same performance," the spokesman said. DG recently introduced general-purpose and array-processing models of satellite processors as high-performance options for the S/250 [CW, April 2]; that system is directed at real-time and time-sharing users.

All currently installed S/130, S/250 and AP/130 CPUs can be field-upgraded to accommodate the additional memory for a fixed price of \$2,000 under contract with local field engineering, DG said.

A "typical" S/130 configuration — featuring 64K-byte memory, memory allocation and protection (MAP), a battery backup and error-checking and correction (ERCC) — now costs \$16,000, the vendor noted.

A representative S/250 featuring noninterleaved 128K-byte memory with ERCC goes for \$34,500. Add-on 128K-byte memory with ERCC costs \$5,000, while add-on 256K-byte memory with ERCC costs \$8,000.

DG is at Rte. 9, Westboro, Mass. 01581.

Small Systems in \$20,000 Range Vary Widely in Speeds, Ascu Finds

By Brad Schultz

CW Staff

BOULDER, Colo. — There are substantial differences in problem-solving times among small computer systems in the \$20,000 price range.

So found the Association of Small Computer Users (Ascu) after completing 12 studies of different systems. Benchmark tests for each study were conducted for Ascu by Real Decisions Corp. of Stamford, Conn., an independent consulting firm.

"We were surprised to discover

that the Wang Laboratories, Inc. 2200VP was faster [than two major competitors] by a factor of more than 20 in solving a standard scientific/engineering problem in which the number of variables was 50 and the precision was 12 digits," according to Hillel Segal, Ascu's president.

Real Decisions compared running times for five standard programs and the results of an "ease-of-use" test. The firm also analyzed responses to a user survey conducted for each system.

Segal emphasized that Ascu is

not recommending any particular system, although it is publishing summaries of these studies as 24-page *Benchmark Reports*. Each report is addressed to a single system and includes execution times clocked by Real Decisions for a variety of jobs under four headings: CPU-intensive and I/O-intensive speed tests, "real-life" problems and an ease-of-use test.

Users can subscribe to the reports — which Ascu expects to issue every month — without

(Continued on Page 76)

Portable Units Offer Bubble Memory

LOS ANGELES — Bubble memory mass storage and an operating system written in Basic are featured in a family of general-purpose portable microcomputers available from Index, Inc.

An upper and lower case alphanumeric display and integral printer also come with the compact units, which reportedly weigh less than 20 lbs each.

The top-of-the-line System 128 offers 128K bytes of magnetic bubble memory for mass storage that can be expanded in 128K-byte increments. The lower priced System 100 includes 90K bytes of mass storage in a minifloppy disk contained by the chassis; floppy storage can be expanded to 400K bytes.

Bubble Binary

In bubble memory, binary information is stored in a stationary, magnetic garnet chip in the form of uniformly spaced magnetic domains — the bubbles. These are arranged in closed loops.

The presence of a bubble in the loop represents a binary 1, while the absence of a bubble represents a binary 0, Index explained.

Induced magnetic fields cause the bubble loops to rotate within the chip, the vendor continued. Information is recorded on or read out of the loops by transfer regions designated as the generator and the detector, respectively. Bubble memory has no me-

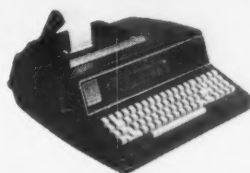
chanical, moving parts and retains stored information even if the system's power is cut off.

"The rugged, solid-state bubble memory also makes [these units] practical as a process controller in inimical environment[s], where disks and tapes decay or might get lost, or for lasting applications, such as building sys-

tems and larger CPUs.

Each unit comes with a gas plasma display panel. These panels are flat, whereas CRTs are

(Continued on Page 76)



Index System 128

tem controls or military equipment," Index claimed.

Both the System 128 and System 100 feature built-in main memories that include 48K bytes of dynamic random-access memory (RAM), 1K byte of static RAM expandable to more than 2M bytes and 8K bytes of read-only memory expandable to 32K bytes. External disk drives can be interfaced with members of the Index series to provide additional mass storage, "meeting virtually any business requirement," the vendor maintained.

The systems also contain serial and parallel I/O and S-100 capability for interfacing with a range of peripheral units, including external printers, cassette recorders, other Index units and

HP System 45 Memory: Capacity Jump, Cost Dive

PALO ALTO, Calif. — Hewlett-Packard Co. has increased by seven times the maximum main memory in its System 45 desktop computer system and halved the cost of adding memory.

Main memory can be expanded to 449K (user-accessible) bytes in the System 45B just added to HP's desktop family. The cost of 45B memory expansion is 4.5 cents per byte compared with the System 45A's 10 cents per byte.

HP also introduced 45 software packs to support the 45B; of these, 17 are adaptations from previously offered packs, while 28 are new, HP said.

Moreover, the System 45 series operating system has been revamped to allow such capabilities as automatic extension of the maximum reserve of line numbers to 32,766. The software upgrade shaves response times and removes former limitations on operating flexibility, HP maintained.

Space for adding present and future read-only memory (ROM) options has been increased in the System 45B from eight to 16 slots. The 45B now



HP System 45B

comes with HP's just-released Advanced Programming ROM.

Any System 45A can be converted to a 45B with either of two upgrade kits, HP noted.

The basic System 45B costs \$12,500, including a processor, a keyboard, a tape cassette, 56K bytes of user memory and a CRT. With graphics capability, a second tape cartridge, a built-in thermal printer and memory expansion to 187K bytes, the desktop unit goes for \$22,500.

A configuration including all of the above features plus memory expansion to 449K bytes costs \$34,100, HP said from 1507 Mill Road, Palo Alto, Calif. 94304.

INTENTIONAL

Priam Primer Traces Disks

CUPERTINO, Calif. — A 12-page booklet describing the evolution of the Winchester disk drive and the differences between Winchester and earlier technologies is free from Priam Corp.

A brief illustrated history traces disk drive development from IBM's Ramac 305, with its 50 disks and 5M-byte capacity, to today's single-disk Winchester drives with up to 33M bytes of data storage.

The benefits of track and bit density and disk drive reliability are discussed in "Who's Selling Rifles to the Indians?" from Priam at 20730 Valley Green Drive, Cupertino, Calif. 95014.

Functions in Real-time

Honeywell Gets Transaction Processing

WALTHAM, Mass. — A real-time, transaction-processing system that reportedly offers data management and display processing facilities for Honeywell, Inc.'s Level 6 family of minicomputers has been introduced by the firm.

Available with the Gcos 6 Model 600 executive, the TPS 6 can be used for a number of medium- and large-scale transaction-processing applications, according to a spokesman.

TPS 6 is also available on Level 6 models 43, 47, 53 and 57 with 128K or more words of memory. It executes as a self-contained Gcos 6 Model 400 facility in parallel with other products such as the file transfer and remote batch facilities, the spokesman said.

The system is said to support three kinds of CRT terminals, which can be simultaneously connected to a single system. The synchronous VIP 7700R can be locally or remotely connected, multidropped from a single line or configured in clusters of up to 10 at any one point, he explained.

The asynchronous VIP 7200 is a low-cost CRT with 24 lines of 80 characters each and a detachable 86-key keyboard, seven of which are function keys. The VIP 7801 is a micro-processor-based CRT.

Screenwrite Language

Applications for TPS 6 can be written in Screenwrite, a language designed for transaction processing.

The system was said to extend the Gcos 6 data management capability with indexed key and detail files accessible by chaining techniques, allowing access to records in several different ways.

In large applications, a file may extend over several disk volumes, the spokesman continued. TPS 6 features transaction restart and recovery for individual terminal programs or for the complete system.

Data files can also be processed by batch programs written in either Screenwrite or Cobol. Batch programs reportedly can be requested from an on-line transaction or from the system console and can be executed in parallel with the on-line system.

Expandable Applications

The field expandability and modularity of the Level 6 minicomputers allows TPS 6 applications to grow with the company, the spokesman maintained. Manufacturers and distributors, insurance companies and government organizations in particular would find the system useful, he stated.

A typical, small Model 43 equipped with TPS 6 and GCOS 6 Model 400, 128K words of memory, two 67M-byte disks, four synchronous VIP 7700R terminals, a 120 char./sec console printer costs \$111,120, including support for one year.

A larger Model 53 with 384K words of memory, two 128M-byte disks, 30 asynchronous VIP 7801 CRTs, a console printer, a 300 line/min printer, system software and one year's support costs \$249,130.

Honeywell is at 200 Smith St., Waltham, Mass. 02154.

System Extends Main Memory Of DEC PDP-11

BOHEMIA, N.Y. — The maximum main memory of any Digital Equipment Corp. PDP-11 minicomputer can be extended to 2M bytes with a memory expansion/management system announced by Periphonics Corp.

The OEM product, called Peripacs, has reportedly been in use for three years as a part of Periphonics' T-Comm 7 intelligent front-end system. Peripacs was said to suit all PDP-11/04, PDP-11/05 and LSI-11 users who do not use DEC's standard operating system.

"Peripacs will appeal to all systems houses building large systems for end users and to sophisticated end users who have written their own operating systems," a Periphonics spokesman maintained.

The system is available in two models — 64K- and 128K- byte versions — with expansion capabilities. Driven by the DEC Unibus, Peripacs does not require any additional processor logic or wiring, the spokesman noted. Its plug directly connects to the Unibus in all PDP-11 processors.

The 64K-byte and 128K-byte versions cost \$5,950 and \$9,950, respectively, and are offered with a 30-day warranty. Periphonics is located at 75 Orville Drive, Bohemia, N.Y. 11716.



Photo courtesy of Universal Pictures.

CalComp's mini-peripheral service engineers won't turn into monsters when they have to work late.

A lot of DEC and Data General mini-peripheral suppliers handle every service call the same way: one problem — one engineer.

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things get "hairy."

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Best of all, CalComp "Maintenance Alert System" service doesn't cost

a penny extra. And it covers every DEC and DG-compatible peripheral we sell — up to 24 hours a day, 7 days a week — depending upon the maintenance contract.

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CalComp mini-peripherals: Because who knows what evil lurks?

Process Keeps Film Color Smooth

One 'Oscar' Contender Won't Be There Tonight

By Marguerite Zientara
CW Staff

CULVER CITY, Calif. — If you tune into the Academy Award presentation tonight, it's certain you won't see a computer on stage. Off-stage, however, a computer-controlled process to ensure color consistency in films is a contender for a 1979 Academy Award for Technical Achievement.

The process is the latest version of a color printing system that has been in continuous development for a decade by MGM Laboratories, Inc., which serves its parent company (Metro-Goldwyn-Mayer), as well as Columbia Pictures, Paramount, Warner Brothers and many independent filmmakers in both theatrical and television productions.

The Cue Analog system, built around a Computer Automation, Inc., LSI 2/20 Naked Mini, was designed to compensate for the fact that a continuous scene in the final product may be comprised of segments filmed under different lighting conditions. Each segment has perceptible variations in color, according to Michael Chewey, chief electronics engineer at MGM Labs and one of the system's developers.

"The system is the first to use minicomputer control," Chewey said, "and it carries the technology of tape preparation for film printing to the ultimate in simplicity, capability and versatility."

Human Element

The preparation system's minicomputer has 8K bytes of 16-bit-word memory. It is connected to Ann Arbor Terminals, Inc., Model 1632 CRT terminal, a Tally Corp. Model 1202 120 char./sec printer and a Remex paper tape reader/punch.

While the minicomputer injects efficiency into the color control process, the process itself has been around for years in different forms. In any method, the process always begins with a subjective, human procedure whereby color variations are detected on a frame-by-frame basis and somehow marked for correction.

Negatives of "dailies" (one day's shooting) are first viewed by a "timing technician" who remains affiliated with a film until the final, released print. It is his job to match the color brightness and density levels and quality of the negative of the film. He does this by "eyeballing" the film, a technique borne of years of experience, a good eye, judgment and a familiarity with the filmmaker's way of doing things.

Originally, the "eyeballing" process was followed by the tabbing or notching of the actual negative to give a cue as to where color corrections were needed. Then, a few years ago, "we pioneered the use of completely automatic bidirectional frame count cueing with all the data contained on a single punched paper tape that controlled the printing process," Chewey recalled.

"It suited our needs at the time, but was relatively slow and inflexible. Unfortunately, it could operate with only one scene at a time."

Since the original Cue Analog Printer Control System, as it was then called, was "cumbersome, hard-wired and

used discrete logic," according to Chewey, the time was ripe for a minicomputer-controlled on-line system.

The Present Process

With MGM's computerized version, a processed negative is "eyeballed" by one of the lab's 13 timing technicians, each of whom has an assistant who records the color values called out by the timer as numerical codes on a timing card. Data from the timing cards is then entered into the minicomputer by CRT operators.

The computer is programmed to compare the numerical values assigned to each of the primary colors to determine which segments require color

correction as well as the nature of the correction needed, Chewey explained. It also reads and stores codes that identify each film segment for use in the paper tape editing process.

The computer then translates its findings into a numerical code that can be read and understood by the film printing machine. This machine-to-machine information transfer is effected by the punched paper tape, which controls light settings in the printer and permits the addition or subtraction of red, green and blue as necessary.

If desired, the computer can also output the data on the CRT screen and/or the printer.

In addition to the on-line system in Chewey's office in the Electronics Department, MGM Labs maintains a support computer system that serves as backup as well as an aid in program development. That system, also on-line, is configured the same as the main computer system, except that it has 32K bytes of memory (half core, half semiconductor), 1M byte of floppy disk storage and no printer.

The bottom line, according to Chewey, is an 80% reduction in operator errors and equipment failures since bringing the computer-based process on-line. "That means dramatically increased throughput and reliability in the tape preparation department."



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Disk Cartridges Fit Top-Loading Drives

NASHUA, N.H. — A line of disk cartridges for top-loading drives has been released by Nashua Corp.

The Model 4442 disk cartridge features a .075-in. disk utilizing 408 cylinders and certified at 4,400 bit/in.

A 10M-byte cartridge with 24 sectors is available for use with the Data General Corp. 6070 drive, while a 12.5M-byte version, with a variety of sector configurations, can be used with Wangco, Inc. ST2422 and Datapoint Corp. 9374 disk drives.

The Nashua Model 4442 disk cartridge costs \$140 from the firm's Computer Products Division, Nashua, N.H. 03061.

Ascu Prints Benchmark Results

(Continued from Page 73)
belonging to that nonprofit association.

Reports are already out for the IBM 5110, the Datapoint Corp. 1170 and the Wang 2200VP. "To start, the benchmark analyses are being performed on the most popular small systems as determined by Ascu member requests," Segal noted. Reports on Texas Instruments, Inc.'s FS 990/10, Hewlett-Packard Co.'s System 45 and Digital Equipment

Corp.'s PDP-11/03 are forthcoming.

"Our eventual goal is to provide reports on all computers actively marketed and, if subsequent tests continue to reveal such dramatic differences between comparable models, our reports could have a substantial impact on computer selection decisions," Segal maintained.

According to Ascu, the Datapoint 1170 cranked out a "scientific/engineering" rou-

time in 38 min, 27.5 sec. The IBM 5110 took 29 min, 47.2 sec to run the same job, while that task shot through the Wang 2200VP in only 2 min, 5.8 sec.

As tested, these systems are priced at \$19,975, \$20,330 and \$20,700, respectively.

'Dream Machine'

"Wang's 2200VP processor, supported by one of three diskette drives, provides users with a system which has two significant strengths: processing speed and high-level support of mathematical functions," its *Benchmark Report* stated.

"The Wang 2200VP offers outstanding number-crunching abilities to the user who needs large, complex calculations done in record time with high speed and precision. Many users think of the Wang 2200VP as a programmer's dream machine."

Users cited "features which give programmers a great deal of control, almost at the systems programming level," the report noted. Among the hardware features cited were "the 32 special function keys, which can be programmer-defined."

However, some 2200VP users have had problems with repair services and worry about file-handling weaknesses, the report said. CRT screen problems plague 5110 users, while IBM support has apparently gone well.

Ascu termed the Datapoint 1170 "a very good way to 'start small' in acquiring computer power."

For 12 issues, *Benchmark Report* subscriptions cost Ascu members \$150 and non-members \$190. Ascu membership, including the association's newsletter, *Interactive Computing*, plus the 5110 report, costs \$25. Ascu can be reached through P.O. Box 9003, Boulder, Colo. 80301.

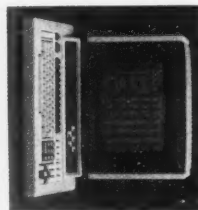
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6086	Tri-State Computer Corp.	22528	25/5	09 DEC 77	3330.00	0.00	3630.00	1420	
6089	Tri-State Computer Corp.	22529	25/5	09 DEC 77	1086.50	0.00	1086.50	1420	
6089	Tri-State Computer Corp.	22530	25/5	09 DEC 77	1139.50	0.00	1139.50	1420	
6094	Tri-State Computer Services	25735	145	09 DEC 77	3490.23	0.00	3490.23	1420	
6094	Tri-State Computer Services	25735	145	09 DEC 77	0.00	33.77	33.77	1420	
6094	Tri-State Computer Services	22531	145	09 DEC 77	125.35	0.00	125.35	1420	
6094	Tri-State Computer Services	28342	4432	20 DEC 77	3490.23	0.00	3490.23	1420	
6094	Tri-State Computer Services	28342	4432	20 DEC 77	0.00	33.77	33.77	1420	
6108	State Electric Company	24107	71700	28 NOV 77	7105.81	67.54	7173.35	1420	
6108	State Electric Company	25767	71700	28 NOV 77	608.60	0.00	608.60	1420	
6108	State Electric Company	25767	71700	28 NOV 77	1161.35	0.00	1161.35	1420	
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Off-Loading Cuts Expansion Costs for College

Special to CW

BOSTON — Dividing a growing computing load between a mainframe and an on-line minicomputer has allowed Boston College's computer center to avoid an expensive mainframe upgrade and reduce anticipated expansion costs by more than \$100,000 per year.

Off-loading has also resulted in substantial improvements in service for academic users, according to computer center director James Kidd and operations manager Paul Smith.

Demand for academic computing services at Boston College — a Jesuit liberal arts institution with an enrollment of 14,000 — has been rising 20% to 25% annually. Until three years ago, nearly all administrative and instructional processing was done on one IBM 370/145 under CICS for administration and CALL/OS for student use of 12 IBM Selectric terminals.

When demand threatened to overtax the system's resources, Boston College exchanged the 370/145 for a 370/148. Favorable leasing arrangements enabled the college to add extra memory and certain peripheral devices for only a small increase in monthly cost.

At about the same time, the computer center addressed a terminal reliability problem by replacing the Selectrics with Digital Equipment Corp. LA36 Decwriter IIs, whose higher print speed reportedly raised throughput for academic users.

Underuse and Frequent Crashes

Unfortunately, CALL/OS itself — which supported nearly all academic activity — was no longer actively maintained by IBM and, according to academic services supervisor George Hetrick, the system crashed frequently.

"We used to have 3,000 plus user identification numbers under CALL/OS," Hetrick recalled. "Of those, approximately 300 could be termed 'active' users. Another 300 used the system only now and then. The remaining 2,400 were inactive — they almost never went near the system, and I believe most of them were discouraged by the lack of sufficient uptime for system access."

Meanwhile, in the face of time-sharing difficulties, demand for service center faced the necessity to expand. The question was whether to upgrade the existing facility with a 370/158 and continue to entrust all campuswide computing activities to a single system or to divide the load by retaining the 370/148 as a batch and interactive system and adding a second interactive system for instructional use.

The center elected to acquire a DEC PDP-11/70 minicomputer to take over student time-sharing duties from the 370/148. The system was delivered in June 1977 with 512K bytes of main memory, a 176M-byte disk drive, 9-track tape subsystem, three 16-line multiplexers and RSTS/E operating software. The Decwriter supply was doubled to 24.

Mini Controversy

Why the switch from a mainframe to a mini?

"We were reluctant to remain with the single-system approach, remem-

bering that whenever either the academic or administrative system went down, all computing activity came to a halt," Kidd recalled. "There was also the matter of cost. The proposed mainframe upgrade would have required an additional \$150,000 annually for lease maintenance."

"On the other hand, we heard the usual scare talk about minicomputer vendor support — 'Leave it on the doorstep, ring the bell and run.' And there was the question of staff: Would we need more personnel to handle a second CPU?"

One factor that influenced the decision to acquire a mini was the center's experience with the 12 Decwriter II

terminals. "They were extremely reliable, and the service for them was good," Kidd said. Moreover, DEC's language and terminal-handling offerings seemed especially attractive.

Finally, "the price tag for the PDP-11 system was about the same as the extra cost of a 158 for one year," according to Smith.

Student Activity Surges

Boston College found the mini "highly reliable" and has credited it with triggering a surge in student computing activity. "We presently count about 4,600 IDs on RSTS, which is more than 50% higher than before," Hetrick said. "Also, about 1,000 of

these belong to truly active users, and most of the other 3,600 use the system at least occasionally."

To keep pace with demand, the computer center has brought the number of hard-wired terminals — most of them Decwriters — to 46 and increased the number of dial-up ports from three to six. Memory has been raised to 768K bytes, and the system now provides remote job entry (RJE) through a 2780 link to the IBM mainframe.

Twenty-nine of the Decwriters are situated in two clusters of small study areas, one in a terminal room near the CPUs and the other in the School of Management, which is the system's largest single source of activity.

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Graphics Processor Fits DEC PDP-11 Mini

NEWTON, Mass. — A 16-bit programmable graphics processor that is plug-compatible with Digital Equipment Corp.'s PDP-11 minicomputers is available from Computer Design & Applications, Inc.

Contained on two hex boards and aimed at OEMs, the Microdisplay Processor (MDP-3) has a refresh memory of 64K 18-bit words. Sixteen bits in the word designate the displayed image, while the two remaining bits are used as graphic overlays, allowing users to highlight data, Computer Design explained.

The MDP-3 will simultaneously drive color and black-and-white monitors, the vendor said. A zoom capability is also offered.

The processor board is a general-purpose, 16-bit CPU with an instruction set resembling that of most minicomputers. The system has a processor cycle time of 190 nsec.

Programmable Memory

Programmable memory is available in 1K-word random-access memory (RAM) and 4K-word erasable programmable read-only memory

(Eprom) versions or as an 8K-word programmable "window" into PDP-11 memory.

Display Memories

Display memories include 64K words of RAM, dual 64K-word RAM overlay memories and 1K (8-bit) byte for storing alphanumerics, Computer Design said. Four microprogrammable display formats are offered: 512- by 512 pixels by 4 bits, 256- by 256 pixels by 16 bits, 128- by 128 pixels by 16 bits and 64- by 64 pixels by 16 bits.

With eight prioritized interrupts, the system features 256 user registers and 16 dedicated registers. A multiply or divide instruction reportedly can be executed in 4.8 nsec.

The PDP-11 communicates with the MDP-3 by reading and writing four registers. Drivers are available for DEC's RT-11, DOS and RSX-11-M operating software.

MDP-3s cost \$7,000 each, when 10 or more are ordered, including software and installation. Computer Design at 377 Elliot St., Newton, Mass. 02160.

Updated TP-50 Lab System Runs Under DEC's RSX11-M

OAK RIDGE, Tenn. — An updated version of Tennecomp Systems, Inc.'s TP-50 laboratory computer system, based on Digital Equipment Corp.'s PDP-11/34 minicomputer, allows the user full use of 124K words of memory and is supported by DEC's RSX11-M Operating Systems.

In contrast to Tennecomp's previous LSI-11-based version, the TP-50's RSX11-M operating system allows multiple users and memory management, according to a spokesman.

The TP-50 reportedly provides a full range of capabilities in pulse height analysis, instrument control and general computation. Under RSX11-M, the TP-50 supports multiple users simultaneously, with each performing a different task.

Users can interact with the system, employing several industry-standard programming languages, including Fortran and Basic, the spokesman noted.

Like the microcomputer-based version, the TP-50 offers a flicker-free display, a push-button functional control panel, alphanumeric and

numeric keyboards and the minifloppy disk system.

Adding Peripherals

The bus translator provided with the system allows the user to add any standard LSI-11 or PDP-11-compatible peripheral to an existing system, the spokesman stated. The general-purpose analog/digital I/O bin provides a

means of interacting with a variety of analytical instruments and devices, he added.

Delivered ready-to-use, the TP-50 has a base price of \$42,000, allowing for two users. Prices vary widely, depending on the application and the number of users.

Tennecomp is at 785 Oak Ridge Tnpk., Oak Ridge, Tenn. 37830.

Disk Controller Makes DG's Nova Mini 'Zoom'

EL SEGUNDO, Calif. — "Imagine your computer coming in the front door as a Chevy and zooming out the back door as a Ferrari" is the way Quentin Research, Inc.'s president described the effect of the firm's recently introduced Model N6010 disk controller, which is compatible with Data General Corp.'s Nova minicomputer.

The controller, designed to upgrade the Nova's performance to the level of the more expensive DG Eclipse minicomputer, was said to solve the problem of slow transfer rates.

The Model N6010 report-

edly allows the Nova to accept data at the disk's maximum transfer rate of 9.67 MHz or 1.2M byte/sec.

Carrying a "no-strings" lifetime guarantee, the unit lets the computer interface up to four Control Data Corp. or other compatible storage module disk drives and supports the RDOS, Iris and Blis/Cobol operating systems, according to a spokesman.

With an array of troubleshooting mechanisms and an overlap seek, the spokesman said, the unit offers additional efficiency.

The N6010 costs \$2,500 from Quentin Research at 610 Hawaii St., El Segundo, Calif. 90245.

Findex Units Have Bubbles

(Continued from Page 73)
bulky, the vendor observed.

The scrolling display provides six rows of 40 dot matrix characters, and the viewing field can be scanned over any data base, making a large screen unnecessary for most applications, the vendor claimed.

The Findex series is supported by Business Basic, Fortran and Cobol compilers. A file management module is incorporated to eliminate the need for user-written sorting routines. A library of business applications programs is also available.

The series can bring the power of a central computer system to the job site or to locations previously considered impractical for systems use, Findex continued.

For example, an insurance executive could design a program for his client in the client's office. Salespeople could have data bases of models, prices, delivery dates, discounts and other relevant information with them on sales calls.

The Findex systems cost less than \$5,000 each, and lease purchase arrangements are available at \$150/mo. Findex is at Suite 707, 1625 W. Olympic Blvd., Los Angeles, Calif. 90015.

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'When I'm CALLing You . . . '

By Jeffrey Beeler

CW West Coast Bureau

PALO ALTO, Calif. — Not even the most advanced processor can turn a person with a tin ear into a hit songwriter or composer, but at Stanford University a professor has developed a microcomputer-based program that can reportedly teach music literacy on at least a rudimentary level.

When perfected soon by its developer — Stanford music and education professor Dr. Wolfgang Kuhn — the prototype program is expected to provide drill-and-practice exercises for various elements of music reading and composition.

With the program, beginning music students in elementary school and college alike will learn music fundamentals like note recognition, scales, music intervals, major and minor keys and melodic dictation, Kuhn ex-

plained.

The program will not teach students to play musical instruments or become master composers. Nor will it altogether eliminate human instructors from the nation's music classrooms.

Rather, the program will supplement existing music curricula by automating many of the routine and repetitive functions that form such an important part of an aspiring musician's education.

For instructors, the program promises to provide relief from many time-consuming, monotonous teaching duties and thus free more classroom time than ever before for creative and challenging musical endeavors, Kuhn said.

For students, the program will ensure more individualized instruction than in a conventional classroom
(Continued on Page 80)

MPU on Board, Memory Card Designed for 6500 Processors

AMES, Iowa — Compas Microsystems, a division of Computer Applications Corp., has introduced the CSB 1, a single-board computer, and the CSB 20, a module in the CSB series of board-level products. Both units were designed for use with 6500 microprocessors.

The CSB 1 can operate as a stand-alone single-board computer or as the processor card in a system using other CSB modules. All modules use the System 65 bus standard on their edge connector for compatibility with 6500-based products.

The CSB 1 includes a 6502 processor, 2K bytes of static random-access memory (RAM) implemented with 2114 memory chips, four sockets for mounting Intel Corp.-compatible erasable programmable read-only memory/read-only memory (Eprom/Rom) chips, one 6522 interface adapter chip, two parallel interface adapter chips, a gold-plated edge connector and three sockets at the top edge of the board for I/O connections.

The unit also provides 50 input or output lines with optional pull-up/pull-down or pull-down resistors, 10 buffered output

lines, two interval timers, a serial-to-parallel/parallel-to-serial shift register and input latching on peripheral ports.

Expansion Card

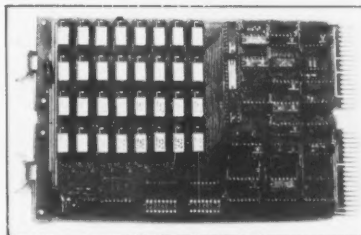
The CSB 20 is a RAM/Rom/Eprom card designed for expansion of systems based on a CSB processor card. It can also be used as an additional memory card for the System 65 development system.

The CSB 20 includes 8K bytes of static RAM provided by 2114 memory chips. Four sockets are provided for mounting Intel-compatible Eprom/RAM chips.

All memories are switch-selectable for address range and can be disabled under switch control, Compas said. RAM addresses are switchable in banks of 4K bytes and RAM memory may be write protected.

Jumpers are used to determine Eprom/Rom type and the memory size is switch selectable to allow use of less than four sockets without unused memory locations, according to the vendor.

The CSB 1 costs \$595 and the CSB 20 is priced at \$495 from Compas Microsystems, 224 S.E. 16th St., Ames, Iowa 50010.



Chrislin CI-1103

Plug-In 64K Bytes Available for H 11

WESTLAKE VILLAGE, Calif. — Designed specifically for the Heath Co. Heathkit/Digital Equipment Corp. H 11 and the DEC LSI-11/2 and PDP-11/03 microcomputers, the Chrislin Industries, Inc. CI-1103 memory module can be directly plugged in without further attachments.

The memory features an 8K by 16 dual-width board using 200 nsec 4K by 1 dynamic memory devices or a 32K by 16 dual-width board using 200 nsec 16K dynamic memory devices.

The CI-1103 is available with either on-board distributed refresh external control logic. Data access time is 300 nsec and cycle time is 525 nsec.

On-board memory select is available in 2K increments up to 128K words of memory.

The 8K by 16 memory costs \$390 and the 32K by 16 costs \$750 from Chrislin Industries, No. 102, 31312 Via Colinas, Westlake Village, Calif. 91361.

Education Computer Fair Scheduled for May 15-17

DETROIT — The first Education Computer Fair will be held on May 15-17 as part of the 17th Annual Convention of the Association for Educational Data Systems (Aeds) at the Detroit Plaza Hotel.

The theme of the fair will be the use of microprocessors in education. Fair coordinators have encouraged attendees to enter education-related applications for competition.

Three entries will be chosen to be exhibited at the June National Computer Conference.

More information is available from Bruce Alcock, Riverdale Country School, W. 235 St. and Fieldston Road, Bronx, N.Y. 10471.

XYBasic Now in ROM Version

CHICAGO — Mark Williams Co. has introduced a version of the XYBasic interpreter that lets both XYBasic and a user's XYBasic programs reside in read-only memory (ROM).

The ROM Squared XYBasic interpreter is compatible with the Z80, 8080 and 8085 systems. It comes with a built-in editor so programs can be loaded directly into memory and debugged line-by-line.

More than one program can be kept in memory at the same time, and a simple command lets the user switch between programs as necessary, a spokesman claimed.

A TRACE command lets the user follow a program's execution by showing every line executed as well as printing all modified variables. BREAK lets a user interrupt a program when any variable is changed or at any line number.

The unit has the ability to transfer ROM to

random-access memory (RAM) for debugging. It provides software interrupts and the ability to monitor external devices and execute a program at the same time.

A DELAY command builds real-time delays into the program so a real-time clock is no longer needed, the spokesman said.

ROM Squared XYBasic is available in integer or extended forms. Extended XYBasic provides the added flexibility of transcendental and string functions, the firm said. A run-time compiler is available to compress the code and reduce execution time.

Versions are available for all 8080-based systems, including the Isis-11, SBC 80/10 and CP/M operating systems.

ROM Squared XYBasic is available for \$295. An XYBasic programming manual can be purchased for \$20. Mark Williams Co. is at 1430 W. Wrightwood Ave., Chicago, Ill. 60614.

Extended Version of Basic

Reference Manual Outlines Applesoft II

CUPERTINO, Calif. — Apple Computer, Inc. is offering a programming reference manual said to fully describe the extended programming capabilities which Applesoft II floating-point Basic offers.

The Applesoft II language is an expanded version of Basic. The manual assumes that the reader has a working knowledge of Basic and wants to learn the additional features offered by Applesoft II.

For those with no knowledge of Basic, the firm provides a free self-teaching Basic manual with its computer system or for \$5.95 separately.

The 10-chapter Applesoft II manual includes a description of what the lan-

guage offers, an overview of commands, definitions and detailed explanations of Applesoft's commands.

An appendix gives a step-by-step explanation of how to get Applesoft up and running in both cassette tape and

firmware versions. Another appendix explains the conversion process of Applesoft and integer Basic.

The manual costs \$6.95 from Apple Computer, 10260 Bandley Drive, Cupertino, Calif. 95014.

Zilog Offerings Compiled

CUPERTINO, Calif. — The Zilog *Data Book*, the first compilation of detailed specifications for Zilog, Inc. components, boards and development systems, is being offered by the firm.

The 132-page publication is aimed at design engineers using Zilog products to construct their own microcomputer systems. Each of the book's three ma-

jor sections begins with a category's significant features.

The catalog lists Zilog's regional offices and contains an order form.

The *Zilog Data Book* is available for \$5 from Zilog's Literature Department, 10340 Bubb Road, Cupertino, Calif. 95014, or from any of Zilog's franchised distributors.

System Helps Teach Music

(Continued from Page 79)

by allowing users to set their own learning pace and repeat lessons they have forgotten or have yet to master.

Kuhn wrote the music program last year to operate with a home microcomputer system manufactured by the Santa Clara, Calif.-based Video Brain Computer Co. Currently available in computer and large department stores throughout the country, the Video Brain system incorporates a Fairchild Camera & Instrument Corp. F8 microprocessor with a 1K-byte random-access memory (RAM), 4K-byte read only memory (ROM) and up to 6K bytes of optional expansion memory, either RAM or ROM.

Fifteen Programs

In these memory modules, the system stores prepared educational programs covering assorted academic disciplines or subjects like English vocabulary, art and elementary business management. Video Brain currently offers about 15 such programs, with another five — including Kuhn's — slated for delivery soon, according to company President Dr. Albert Yu.

When loaded with the Stanford professor's music program, the system will conduct four drill-and-practice lessons entitled "Scales," "Intervals," "Melodies" and "Melody Games." Both of the middle exercises consist of several "topics," or sets of musical drills, each set more difficult than the last.

"Melody Games" produces an educational battle of wits in which one player tries to duplicate a simple tune improvised by another. The student who completes the exercise with the fewest number of errors wins the game.

Works From Keyboard

Users operate the radio-sized microcomputer system from a built-in typewriter keyboard, some of whose keys have been modified to correspond to an octave on a piano keyboard. Together, the microcomputer and its keyboard link to a standard black-and-white or color television, which displays a user's keyboard entries as musical notations.

After the system is turned on, the TV screen lists the four musical exercises available in the program, and students indicate which of the four they want to study by hitting the appropriate selection key on the system's keyboard.

If a student chooses, say, the "Scales" exercise, the display screen flashes a message asking the individual to select the musical key whose scale he wishes to practice. That selection made, the system plays the correct sequence of sounds through the TV's speaker while flashing the corresponding series of musical notes on the screen.

The system then asks the student to play the same scale from memory on the simulated piano keyboard. If the student responds correctly, the system flashes a congratulatory message on the TV screen and repeats the procedure with the next musical key chosen by the individual.

If, however, the user gives the wrong answer, the system replays the key correctly and asks the individual to try again.

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2.

Our Show Issue

This is the issue we publish as the show opens. It'll have last-minute show information, speech previews and other show details. If you're there, pick up a copy at the **Computerworld** booth. Issue date is June 4th. Color ads must be in by May 18th, black and white by May 25th.

3.

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Before the hall gets cold, our staff of 20 editorial people will have prepared their reports and filed them in time to appear in this informative wrap-up issue. You'll read who said what, who introduced what and how it works, and review the show's features and highlights in words and pictures. Issue date is June 11th. Color ad close is May 25th, and black and white ads close June 1st.



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Competition From Minis Cited Intel Puts Service Divisions on the Block

By Marcy Rosenberg
CW Staff

SAN FRANCISCO — Increased competition from the minicomputer arena has forced Intel Corp. to withdraw from the general financial and accounting services market.

The firm plans to divest six or seven divisions within its Data Services Group that provide predominantly batch-oriented financial reporting services and a limited number of on-line accounting services.

Combined assets from these operations amounted to about \$60 million as of Dec. 31, 1978, accounting for less than 5% of Intel's

\$1.3 billion in total assets for that period, according to Peter S. Redfield, Intel president and chief executive.

Redfield admitted these divisions "in total were losing money" although, individually, some were profitable. He declined to name the divisions, but noted they served general as well as specialized industries such as the medical, trucking, insurance and banking markets.

On the Block

Intel is negotiating to sell divisional assets including associated employee groups, their customer bases and accounts receivable, according to Richard Lussier, executive vice-president. He refused to reveal how many employees currently work for these divisions.

"In no case," however, will these businesses cease to operate, he emphasized, because "Intel will continue to operate those divisions for which we can't find buyers or get an attractive price."

Several companies have expressed interest in these account-

ing service operations, according to Redfield, who would not name them but expects to complete final sale agreements "within the next 60 to 90 days. We want to make sure the divisions are properly grouped — some divisions are more attractive than others."

Intel expects to offset the impact of the planned divestiture on net income by the flowthrough method of accounting for investment tax credits that the firm adopted in January.

As for short-term business goals, the company will continue to focus on those of its on-line service operations that promise to deliver "better returns on investment," Redfield said. These include the Autex Division's real-time block trading information system and Autotex computerized automobile estimating system, which the firm began to market a year ago and claims to have placed in more than 100 installations.

In addition, Intel will direct its efforts to three small service operations Redfield refused to name that target systems to the com-

munications, utility and medical industries.

Assets from these operations plus Autex and Autotex also amount to about 5% of total Intel assets, but Redfield maintained they offer "potentially higher added value" than general accounting services.

Unlike the accounting operations up for sale, these on-line services require fewer sales and operations personnel, "have major market positions, are based on large data bases and are less exposed to the competitive pressure of minicomputers," he explained.

Currently, the Data Services Group is headquartered in Greenwich, Conn., but Intel plans to move some 20 to 30 group executives to leased offices in a new building near corporate headquarters by the summer.

The move will bring Data Services executives in closer day-to-day communication with corporate management, Lussier said. The company plans to lease the Greenwich offices to an outside party.

NBS Lets Small Units Off Hook

WASHINGTON, D.C. — Small computer systems will not have to comply with the recently promulgated federal I/O channel-level interface standards, the National Bureau of Standards has decided.

In general, systems costing the government less than \$400,000 will be exempt from compliance with the standards, NBS said. That price, which refers to the "maximum normally employed configuration" of a system, includes all hardware and operating system software for a "tightly coupled" system usually installed in a single room, the bureau explained.

The exemption criteria were announced in the March 19 *Federal Register*. The decision to exclude small systems from the requirement to conform with these standards was based on "the cost of using such a complex interface relative to the cost of these smaller systems," NBS said.

The standards were passed earlier this year [CW, Feb. 26].

The statement of criteria and the proposed "initial exclusion list," which identifies more than 600 microcomputers, minicomputers and other small systems, can be obtained from the Director, Institute for Computer Sciences and Technology (ICST), NBS, Washington, D.C. 20234. Comments on the list should be submitted in writing to the ICST, postmarked no later than May 4.

After reviewing the comments, NBS will prepare its initial list of small systems excluded from compliance with the I/O standards and maintain a mailing list of vendors, federal agencies and other interested parties who will receive copies of the exclusion list on a regular basis.

NBS said notice of any proposed changes to the exclusion list will be sent to all those on the mailing list, allowing 45 days for comments before any changes are finalized.

CCIA Backs Multiyear Pacts

By Jake Kirchner

CW Washington Bureau
WASHINGTON, D.C. — The Computer & Communications Industry Association (CCIA) is backing a legislative proposal that would authorize government agencies to enter into multiyear equipment procurement contracts under certain conditions.

The Federal Acquisition Reform Act, introduced Jan. 15 by Sen. Lawton Chiles (D-Fla.), could provide major benefits to DP equipment and service vendors that bid for government contracts, according to CCIA.

The association is "particularly encouraged" by a section of the legislation "which authorizes agencies to execute multiyear contracts so long as Congress has appropriate funds for the contract's first year," according

to Philip S. Nyborg, CCIA vice-president and general counsel.

The bill would "consolidate and modernize the statutory framework governing federal procurement and establish a single, simple procurement regulation with governmentwide applicability," according to Chiles.

The CCIA comments were contained in a Feb. 27 letter to Chiles in which Nyborg said the multiyear contract provision "is particularly necessary for economical acquisition" of DP equipment and services. "Agencies have long needed clear, legislative authority for multiyear leasing," Nyborg wrote.

"Almost eight years ago, the General Accounting Office [GAO] reported that the government could save literally millions of dollars if it entered into multiyear leases for automated DP

equipment," Nyborg noted. "Yet to this day, the government has not implemented effective means of obtaining true multiyear leases that will give the government the lowest possible price."

Planning for Cancellation

Nyborg noted that "although the government does enter into [DP] leases which may be extended for more than one year, the leases are subject to cancellation at the end of each fiscal year or during each fiscal year on 30 days' notice." Agencies insist on these termination clauses in part because long-term leases are usually funded with one-year money.

The problem is compounded by the fact that the government has "severely limited vendors' rights to collect reasonable termination

(Continued on Page 83)

Wants Documents From Cary

Justice Hits IBM for 'PR Rhetoric'

By Connie Winkler
CW Staff

NEW YORK — IBM's apparent stonewalling on a request for documents in connection with the upcoming deposition of IBM Chairman Frank T. Cary in the U.S. vs. IBM antitrust trial here is "public relations rhetoric," according to the Justice Department.

"IBM's public relations rhetoric should not divert attention from the merits of this controversy and, in a larger sense, this case," the first argument in the government response to IBM's motion

to quash the Cary documents stated.

IBM's protests to turning over the Cary documents are similar to those voiced when the government asked for documents on the subject of relief. In both instances, news stories of IBM's action appeared in the *Washington Post* and/or *The New York Times* the day after the motions were filed [CW, April 2]. The government called this "IBM's public relations offensive."

In early February, the Justice Department sent Cary a subpoena duces tecum, which means

he is to bring with him the documents requested in the subpoena. In Cary's case, the list of 1974-to-present documents is eight pages long and covers most areas of IBM's data processing business. The Cary deposition is still tentatively set for today.

IBM answered several weeks ago with a 37-page motion to quash the document request. The latest development was "Plaintiff's Memorandum in Opposition to IBM's Motion to Quash Subpoena Duces Tecum served on Frank T. Cary," which

(Continued on Page 88)

Cary Claims Federal Regulations Too Costly

By Jake Kirchner

CW Washington Bureau

WASHINGTON — Congressional deregulatory fervor was at its height when IBM Chairman Frank T. Cary testified before the Senate Governmental Affairs Committee recently about the burden of regulation on U.S. industry.

Representing the Business Roundtable, Cary presented findings by that organization showing 48 selected companies spent more than \$2.6 billion in 1977 to comply with regulations of only six federal agencies and programs.

The study, prepared by the accounting firm of Arthur Andersen Co., included AT&T, General Electric Corp., IBM and TRW, Inc. Cary told the Sen-

ate panel Tuesday that the \$2.6 billion amounted to 10.1% of the \$25.8 billion in total capital expenditures of the 48 companies during 1977.

"The incremental cost of regulation was 15.7% of net income and 43.3% of research and development costs," he said.

The Tip of the Iceberg

But these costs are only "the very tip of the regulatory iceberg," the IBM executive added. They represent actions taken to comply with specific regulations only — actions "that would not have been taken in the absence of the regulation."

Indirect costs would include expenses resulting from "regulatory delays, losses in productivity, miscalculation

of resources or adverse effects on international competitiveness."

The six regulatory agencies and programs investigated were the Environmental Protection Agency, the Occupational Safety and Health Administration, the Department of Energy, the Federal Trade Commission, the Equal Employment Opportunity Commission and the Employee Retirement Income Security Act.

Cary conceded that the study made no attempt to measure the value to society of those regulations. He said the Business Roundtable wished only to support congressional measures that would require regulatory agencies to determine the cost-effectiveness of their actions.

Cary's presentation was well received

by the Senate committee, which is considering two bills to prevent excessive government regulation. The reform of the Federal Regulation Act (S. 262), introduced by Senators Charles Percy (R-Ill.) and Governmental Affairs Committee Chairman Abraham Ribicoff (D-Conn.), would require the economic effects of regulation to be considered in agency proceedings.

Another bill, S. 445, the Regulatory Reform Act of 1979 sponsored by Ribicoff, Percy and Sen. Robert Byrd (D-W.Va.), mandates periodic review of regulatory agencies. Sunset legislation would abolish any agency that could not justify its existence to the satisfaction of Congress.

The Carter Administration has taken a strong stand against regulations that are not cost-effective or are unnecessarily duplicative. The President has formed a regulatory analysis review group and a regulation council and last March issued Executive Order 12044, which broadened the requirements for economic impact analysis in the regulatory process.

Cary applauded the Administration and congressional actions. He added that the Business Roundtable is undertaking another study to determine regulatory costs to industry in 1978.

Data Base - The Next Five Years

Infotech State of the Art Conference

Jack Tar Hotel, San Francisco, May 7-9, 1979

What will happen in data base technology in the next 5 years? At this Conference a panel of international experts examines the immediate future, concentrating on the practical implications of developments that we already clearly established.

3 DAYS OF INTENSIVE DEBATES AND DISCUSSIONS

Monday, May 7th

- The next 5 years in Data Base Technology
- The ANSI/SPARC DBMS proposals
- The CODASYL DDLC proposals
- The CODASYL DSDL proposals

Tuesday, May 8th

- Classification: a basic tool for Data Base
- The next 5 years: vendor's viewpoint
- A survey of relational languages
- Data Base Machines

Wednesday, May 9th

- How to increase Data Base programming productivity
- Data Models: the next 5 years
- Practical guidelines for the next 5 years
- Forum

SJIR NIJSSEN: INFORMATION ANALYSIS Infotech State of the Art Tutorial Jack Tar Hotel, San Francisco, May 10-11, 1979

This intensive State of the Art Tutorial presents a practical proven methodology for analyzing the information requirements of systems, and translating those requirements into an optimum database design. The presenter is Sjir Nijssen of Control Data (Belgium), who led the team that developed the methodology and subsequently applied it in practice, with dramatic success, in the development of large-scale systems. Dr. Nijssen is not only one of the world's leading researchers and practitioners in the database field, he is also an exceptionally stimulating and entertaining speaker.

DAY 1

1. Overall framework for the design and implementation of information systems.
2. Overall architecture for future data base management systems.
3. Concepts to describe a conceptual schema.
4. How to design a conceptual schema.

DAY 2

5. How to design a conceptual schema: case study.
6. Two kinds of conceptual schema.
7. The complete information analysis cycle: a case study.
8. Information dictionary.

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Newsletter Offers Marketing Advice

INDIANAPOLIS — A periodic marketing newsletter for companies that develop, sell and support computer-based products is available from B. Cross Associates, a marketing support and consulting firm here.

Called "Crosswords," the publication focuses on tools and techniques for selling software, data services and turnkey systems, the company said.

Subscriptions are free and can be obtained by sending name and address to Editor, "Crosswords," c/o B. Cross Associates, Suite 530, 9000 Keystone Crossing, Indianapolis, Ind. 46240.

In Filings With FCC

Adapso, Cbema and CCIA Point to DP in ACS

By Jake Kirchner

CW Washington Bureau
WASHINGTON, D.C. — Opponents of AT&T's proposed Advanced Communications Service (ACS) told the Federal Communications Commission (FCC) recently that they dispute AT&T's arguments that the service is basically a communications offering with only "incidental" DP capabilities.

In comments filed with the FCC March 20, several DP and communications industry associations said that despite AT&T's claims, the company's own description of ACS shows it to be predominantly a data processing service — which, under existing FCC regulations, AT&T may not provide.

"AT&T has clearly designed ACS to perform a wide range of data processing activities," the Association of Data Processing Service Organizations (Adapso) told the commission. AT&T has not produced "a scintilla of evidence" that it would be impractical or uneconomical to use ACS facilities for data processing activities, as the company insisted in its Feb. 15 FCC filing [CW, Feb. 26]. Adapso said.

The Computer and Business Equipment Manufacturers

CCIA Backs Longer Pacts

(Continued from Page 81)

charges if the government cancels a 'multiyear' lease before the full lease term expires," he continued. "To make matters worse, most agencies do not permit vendors to recover any termination charges, even to the limited extent permitted by GAO.

"As a result, many vendors have raised their prices to cover the contingency that their 'multiyear' lease may be canceled prematurely. The government would pay lower lease rates if it offered true multiyear leases which provide adequate compensation for early cancellation."

The bill would make the changes in procurement policy that are necessary for the government to obtain the lower lease rates, Nyborg added, urging Chiles to consider introducing the multiyear lease section of the bill "as separate legislation to expedite its passage."

The CCIA also suggested that the five-year limitation on leases called for in the bill be raised to 10 years for leases of DP equipment. "This period corresponds more accurately to the systems life of many DP systems," Nyborg said.

Association (Cbema) said the "call" and "message" features of ACS "involve predominantly a data processing service that cannot be offered under tariff." Data transmission through the ACS network "takes a distinctly second place to storage, processing, retrieval, manipulation and use of the input data according to programmed instruc-

tions designed by or for each customer.

"Indeed, AT&T conceded [in its Feb. 15 filing] that data may simply be stored in the ACS node, never once forming an addressed message to any other person, terminal or host," Cbema noted.

CCIA Agrees

Agreeing was the Computer

& Communications Industry Association (CCIA), which said "ACS, by AT&T's own description, is a data processing service" — "by far the most encompassing and powerful data processing service proposed to date by AT&T."

The CCIA further argued that ACS "involves two distinct service proposals," a packet-switched network and

an electronic message service based on the network. The association urged the FCC "to allow ACS to be offered as a legitimate packet-switched data communications service and to defer any decision on the electronic message service component of ACS pending the outcome" of the commission's current Computer Inquiry.

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CW-4-79A

Could Reach \$1 Billion by '85 Arab Imports of DP, Office Gear Skyrocketing

By Bohdan O. Szuprowicz

Special to CW

Imports of computers and office equipment by Arab countries have been growing faster in recent years than similar shipments to other regions of the world. Between 1973, the start of the oil embargo, and 1976, computer and office equipment imports skyrocketed from \$56 million to \$140 million.

If this rate of growth continues until 1985, Arab computer markets will reach almost \$1 billion.

At the end of 1976, those markets were growing at an annual 24% despite a drastic 80% drop in the Lebanese market resulting from the civil war in that country. DP imports in Tunisia and Sudan also slowed down.

Arab computer imports may have surpassed Western DP exports to all

Soviet Bloc countries this year. The Soviet Bloc imported \$776 million in 1976, down from the 1975 high of \$825 million. But imports from Western countries represented only \$188 million, also down from the 1975 high

funds are earmarked mainly for infrastructure projects such as the construction of roads, electric power, schools, telephone networks, irrigation and port facilities.

Present Inventory

At present, about 550 general-purpose computers are estimated to be in operation in Arab lands, mostly in government departments, oil companies, banks, educational and research institutions and trading firms. This represents a penetration of only about 7.5% of the potential market during the next decade or two, based on existing manufacturing and trading enterprises that could benefit from the use of a computer in the immediate future.

No more than 10 major manufacturers are represented in the Arab computer markets. IBM is leading with about 30% of all installations, but its market shares vary widely from a near monopoly in Libya to almost zero in such pro-Soviet Arab countries as Syria.

But IBM also has the largest computer installations in the Arab world — Aramco in Dhahran, Saudi Arabia, where 370/158 and 168 machines are at work and an IBM 3033 is on order.

NCR Corp. and CII-Honeywell Bull of France appear to be competing for second place in the Arab world, but CII-Honeywell Bull is strongly represented in Algeria, Tunisia, Egypt, Syria and Lebanon. Robotron of East Germany has managed to penetrate the Iraqi market with two large EC-1040 computers comparable to IBM 370/145 machines, and old Soviet Minsk-22 computers are reported in Egypt.

Japan is also represented, with a Fujitsu Ltd. Facom 230-48 on order for the Arabian Computing Center in Saudi Arabia, in which Fujitsu holds 20% interest. The center trains computer specialists for Saudi Arabia and neighboring states.

Toshiba has also two fairly large computers installed in Iraq. In addition, a lot of Japanese calculating and office equipment is being imported into the gulf states.

Among the minicomputer manufacturers, Digital Equipment Corp. and Hewlett-Packard Co. are the leading suppliers with multiple installations in operation or on order in Saudi Arabia and Iraq, respectively. Other minicomputer manufacturers also active in Arab markets are Prime Computer, Inc., Data General Corp. and Micro-data Corp.

But the biggest deals in the Arab computer markets may well belong to the DP service companies that can provide a full range of systems design, programming, installation and facilities management services. This is inevitable because of a dire shortage of Arab computer personnel and lack of training facilities.

Computer Sciences Corp., Electronic Data Systems, Computel Systems Ltd. of Canada and the UK's Acicon have all received contracts totaling several millions of dollars to design, install and operate various computerized systems in Saudi Arabia alone.

Turnkey operation, it seems, is the wave of the future in the land of the petrodollar.

International News

of \$197 million.

By comparison, practically 100% of Arab computer imports come from the West, and there is not likely to be an Arab computer manufacturing industry to compete with Western imports.

Saudi Arabia now ranks as the largest importer of computing equipment in the Arab world, having surpassed Algeria, which occupied the top spot until 1974. The Saudi market reached \$26 million by the end of 1976, growing at 50% — twice the average rate of all Arab countries.

If Saudi imports continue their present growth for the next few years, that market in 1980 will be larger than the total imports of all 20 Arab states in 1976.

Limits on Growth

There are limits on computer utilization growth in Arab countries, however, that have nothing to do with shortages of hard currencies so common in the Soviet Bloc. Many Arab states have significant surpluses of foreign exchange from the export of petroleum products, while other Arab countries have access to several multi-billion-dollar development funds operated by such oil-rich states as Kuwait and Abu Dhabi.

The limits to computerization in Arab states stem from a relatively low level of industrialization and very low literacy rates. As a result, development

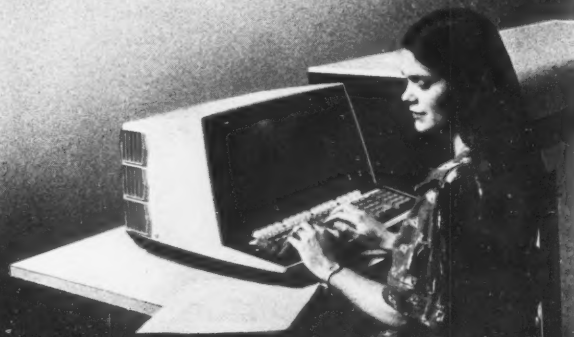
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Survey Finds Demand for Engineers Soaring

PHILADELPHIA — One out of every three recruitment ads in the help wanted pages of the nation's newspapers seeks engineering personnel. Professional engineering magazines have quadrupled their volume of classified advertising during the past year.

In the first two months of 1979, the overall U.S. demand for engineers increased 15.6% from the same period a year ago — and last year's demand for engineers was 25% greater than in the previous year.

These are some of the conclusions of the Fox-Morris Personnel Consultants' 1979 Engineering Survey.

"At the top of everyone's 'most-wanted' list of 1979 talent are mechanical engineers," according to Sanford

L. Fox, president of Fox-Morris. Electronics, electrical and industrial engineers, particularly those with experience in manufacturing and in controls and instrumentation, are also high on the list.

"The most coveted engineers in every discipline are those with two years to five years of experience," Fox pointed out. This group displays the ideal combination of proven talent with realistic salary expectations, according to employers interviewed.

Among recent engineering school graduates, the strongest demand is for those with industrial and mechanical degrees, followed by electronics and chemical backgrounds, the study found.

At the senior level — those engineers with 7 to 12 years of experience — mechanical engineers are the highest in demand followed by electronics and industrial engineers.

The intense demand for engineering talent has driven salaries up dramatically, Fox said. Overall, 1979 salaries have already jumped 13.8% compared to salary levels a year ago (see chart below).

Reasons for Demand

A major factor in the demand cycle is simply that modern society has become increasingly more technical, Fox said.

Aside from societal needs, another cause of the demand spiral is the actual shortage of engineers. The U.S. engineering work force shrinks by about 10% a year, or about 75,000 engineers, while the engineering schools replenish only about 80% of that attrition, the study noted.

This shortage has roots in the economy of the late 1960s and early 1970s, when there were too many engineers and too few jobs. Many college students responded to the leveling in this marketplace by shunning engineering

schools during the early 1970s. That reaction is now being felt by employers throughout the U.S.

During the 1975 recessionary period, many companies cut engineering staffs to the bare minimum. They continued staffing at low levels through 1976 and even into 1977 despite rapidly increasing work loads, Fox suggested.

Barring a recession, virtually none of the personnel executives responding to the survey foresaw any slackening of the demand for engineers in the foreseeable future, the report concluded.

Course Teaches Design of ICs

SUNNYVALE, Calif. — Interdesign, Inc., a producer of semicustom integrated circuits (IC), has developed a course to teach engineers how to design custom ICs for use in their own products.

The Interdesign Lecture Course is composed of 10 audiovisual lectures, each about 30 minutes long. Each lecture is self-contained, consisting of a full-color 35mm filmstrip with a synchronized audio narrative.

Included in the course package are five copies of the IC design course text; a bound book which includes all material contained in the audiovisual presentation; three design kits covering linear and NMOS, CMOS and ULA bipolar digital technology; and a Dukane 35mm audiovisual filmstrip projector.

The course can be purchased for \$975 or leased for \$100/week. Further details are available from Interdesign at 1255 Reamwood Ave., Sunnyvale, Calif. 94087.

Supershorts

Hazeltine Corp. will buy a 155,000 sq-ft building in Commack, N.Y., to replace current leased facilities and increase manufacturing capability for industrial information electronics equipment and systems. The \$3.6 million purchase will be completed in April.

Ramtek Corp. plans to move to a new leased 85,000 sq-ft facility at 2211 Lawson Lane, Santa Clara, Calif. The lease includes an option to add 85,000 to 100,000 sq ft adjacent to the new building, which will house about 300 employees.

Qume Corp. signed Alanthus Data Communications Corp. to distribute its line of Sprint 5 printer terminals.

Heritage Bancorporation, a Chicago-based bank services company, has acquired First Financial Accounting Corp. of America, a data processor that serves 17 banks in the Chicago area. Heritage plans to merge First Financial into its own data facility in Hillside, Ill., to serve more than 40 banks and other DP customers.

1979's MOST WANTED ENGINEERS

RANKING	PRIMARY ENGINEERING TITLE/FUNCTION	INTENSITY OF DEMAND ACROSS U.S.*
1	Mechanical	9.5
2	Manufacturing	9.0
3	Chemical	8.9
4	Controls/Instrumentation	8.6
5	Industrial	8.5
6	Electronics	8.4
7	Electrical	8.0
8	Metallurgical	7.0
9	Research & Test	6.8
10	Environmental/Safety	6.1

*On a scale with 10 the highest, 1 the lowest.

Source: Fox-Morris U.S. 1979 Engineering Survey

1979's HIGHEST-PAID ENGINEERS*

(Ranked by Experience)

RANKING	NEW GRADUATES	2-5 YEARS EXPERIENCE	6 YEARS AND UP EXPERIENCE
1	Petroleum \$18,100 (\$14,000-\$23,000)	Petroleum \$24,900 (\$22,000-\$35,000)	Petroleum \$33,900 (\$26,000-\$45,000)
2	Mechanical \$17,600 (\$15,000-\$19,000)	Chemical \$23,300 (\$20,000-\$27,000)	Metallurgical \$33,480 (\$25,000-\$40,000)
3	Chemical \$17,200 (\$16,500-\$19,200)	Control/Instrumentation \$22,850 (\$19,000-\$27,000)	Mining \$32,050 (\$28,000-\$45,000)
4	Control/Instrumentation \$17,100 (\$15,000-\$20,000)	Mining \$22,750 (\$20,000-\$28,000)	Chemical \$31,700 (\$25,000-\$40,000)
5	Electronics \$17,050 (\$14,000-\$21,000)	Metallurgical \$22,700 (\$21,000-\$28,000)	Mechanical \$30,500 (\$23,000-\$50,000)
6	Mining \$17,000 (\$13,000-\$19,000)	Research & Development \$22,650 (\$19,000-\$35,000)	Research & Development \$30,300 (\$23,000-\$40,000)
7	Metallurgical \$16,950 (\$14,000-\$18,000)	Electronics \$22,580 (\$17,000-\$30,500)	Electronics \$29,890 (\$23,000-\$45,000)
8	Aeronautical \$16,750 (\$13,000-\$18,500)	Mechanical \$22,500 (\$18,500-\$28,000)	Control/Instrumentation \$29,350 (\$23,000-\$40,000)
9	Electrical \$16,570 (\$14,500-\$19,000)	Aeronautical \$22,440 (\$21,000-\$23,500)	Electrical \$28,850 (\$23,000-\$35,000)
10	Research & Development \$16,550 (\$14,000-\$18,500)	Electrical \$21,990 (\$17,500-\$28,000)	Aeronautical \$28,800 (\$25,000-\$35,000)

*Figures show U.S. salary averages, with U.S. salary ranges in parentheses.

Source: Fox-Morris U.S. 1979 Engineering Survey

CI Notes

SPC to Market Hitachi Fax

BURLINGAME, Calif. — Southern Pacific Communications Co. (SPC), Hitachi, Ltd. and Nissho-Iwai American Corp. have signed an agreement naming SPC as the distributor in the U.S. for a high-speed digital facsimile terminal developed by Hitachi.

Nissho-Iwai American, the New York City branch of the Japanese trading company, acted as the intermediary in the negotiations between Hitachi and SPC.

The transmission time for the terminal is less than one minute for an 8.5-by 11-in. document, with extremely high resolution quality, SPC

claimed. The terminal is also readily adaptable for interface to varying models of other facsimile manufacturers.

SPC expects to market the terminal early this fall under its own name. Complete specifications on the terminal, along with the pricing structure, will be released at a later date.

ADR Sells Software To Russia and Bulgaria

PRINCETON, N.J. — Applied Data Research, Inc. (ADR) has announced procurement agreements with Russian and Bulgarian government agencies.

The agreements, subject to U.S. Department of Commerce approval, call for ADR to license most of its system products to those agencies.

"This is the first time ADR has marketed its system products to Eastern European countries," John R. Bennett, ADR president, said. Bennett claimed the software sales were prompted by ADR's penetration of the international software market, with more than 3,000 products installed internationally, 75% of which are in Europe.

ADR software will operate on ES series (Riad) equipment in Moscow and Bulgaria.

PE Acquires Etec, Electron Beam Maker

NORWALK, Conn. — The board of directors of Perkin-Elmer Corp. (PE) has approved the acquisition of Etec Corp.

Etec, located in Hayward, Calif., is a supplier of electron beam exposure systems used by the semiconductor industry.

PE will acquire all of Etec's issued and outstanding stock for an undisclosed amount of cash.

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Pactel Sees Europe Thinking Small

FRIBOURG, Switzerland — Fueled by the proliferation of retail distribution outlets and improved price/performance ratios, the Western European market for small business systems will more than triple by 1986, when it will equal nearly half the value of the mainframe market there.

The \$1.58 billion market for small business systems is expected to climb to about \$5.5 billion in eight years, according to a report from Pactel International SA here.

Similarly, Pactel expects the installed base of small business systems in Western Europe to grow 22.4% per year to pass the \$1 billion

mark by 1985.

While the overall small business systems market should be able to sustain an influx of new suppliers, dominance by mainframers, notably IBM, in the higher end systems area may draw most newcomers into the burgeoning low-cost, microprocessor-based smaller systems arena, Pactel noted.

Priced at \$995, the report on "The Small Business Systems Marketplace in Western Europe, 1978-1986," is available from Pactel, PA Computers and Telecommunications, Grand Rue 56, CH 1700 Fribourg 2, Switzerland.

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THE FORTUNATE 96.

NDC Exits Hotel, Enters Health Services Mart

By Connie Winkler
CW Staff

NEW YORK — National Data Corp. (NDC) is getting out of the hotel voice reservations business and into a more profitable one — Datastat, an interactive system for pharmacies.

Because of these changes, NDC expects a 25% to 30% increase in earnings for the fiscal year ending May 31, L.C. Whitney recently told the

New York Society of Security Analysts. The Atlanta-based firm, of which Whitney is president, delivers banking, consumer credit and health care services.

For the third fiscal quarter ended Feb. 28, NDC reported earnings of more than \$1 million or 23 cents per share which represents a 28% increase over the same 1978 quarter, when earnings were \$797,000 or 18 cents per

share.

For the nine-month period ended Feb. 28, unaudited net income was \$2.8 million, or 63 cents per share, a 26% increase over the year-ago period, when net income was \$2.2 million or 51 cents per share.

Whitney said third-quarter operating revenues increased 28% from \$8.9 million in the previous year to \$11.4 million in 1979, while for the nine-month period operating reve-

nues increased 25% from \$26.3 million to \$32.8 million.

Pool or Patio?

NDC had been providing voice network reservation services to several hotel chains, but the business was too costly, Whitney said. By the time the caller had decided on the hotel, the kind of bed and the location of the room — by the pool or patio — six minutes had elapsed. This was too

much time per call.

The main service of NDC's computer services business is providing money information — such as daily tallies of deposits from field locations — to banks and corporations.

However, NDC is now going all out on its health services system, Datastat, which NDC is marketing with McKesson & Robbins Drug Co. An on-line terminal at the pharmacist's window provides prescription control, label preparation, third-party billing and patient profiling as well as basic management of patient records and receipts, inventory control and pricing.

Lick-and-Stick Syndrome

No longer does the druggist have to be caught in the count, pour, lick and stick syndrome as he struggles to fill prescriptions and keep up with paperwork. Druggists access through two units, a combined terminal and CRT and a printer, which lease for approximately \$900 a month, including telephone communications costs.

NDC has sold 75 of the systems and has a 250-system order from McKesson. Whitney guessed the break-even point on Datastat would be 300 installations.

Although NDC is moving into new product areas, Whitney emphasized that the company's major thrust is providing services to banks. "The top 140 banks in the U.S. today use NDC services in order to bring services to their clients," he said.

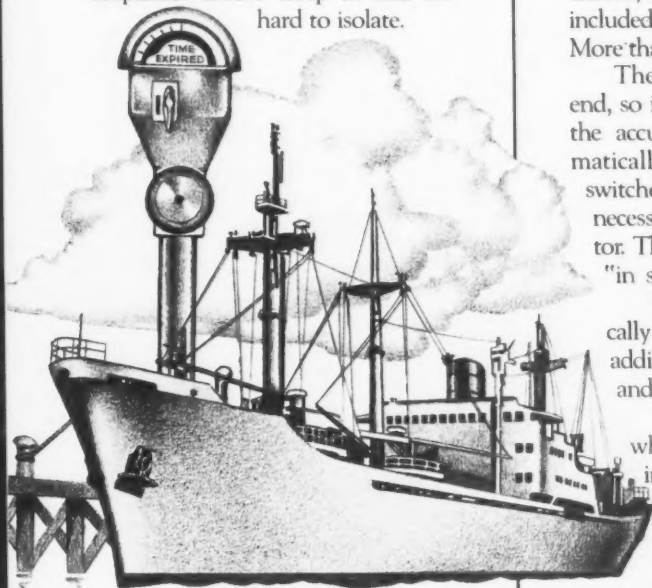
The past year was especially good for NDC because many banks were permitted to issue both Master Charge and Visa cards. NDC's system for authorization allowed for both, so it was set to handle the increased business.

NDC is working to provide banks the full menu of services they have been requesting. By the end of April, NDC expects to complete the acquisition of Interactive Sciences Corp. (ISC) of Braintree, Mass., in exchange for about \$2.5 million in NDC stock.

ISC, a time-sharing house, has been working closely with NDC. Its modeling and forecasting work will mean an additional \$5 million in revenues for NDC, Whitney said.

PROBLEM:

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IBM Accused of 'Public Relations Rhetoric'

(Continued from Page 81)
was accompanied by an affidavit from head government counsel Robert J. Staal.

"While claiming the scope of documents subpoenaed is overly broad, [the] defendant has flatly refused to negotiate it," the government affidavit stated. "This fact discloses IBM's true motive as a stratagem to elicit testimony from Mr. Cary on current and future timeframes while denying plaintiff access to contemporaneous documents relevant to the subject matters of his testimony from the files of IBM."

IBM's motion to quash is the second recent, vehement attack on the government requests for additional documents. In February, IBM loudly ob-

jected to turning over documents in relation to forming a relief proposal should the computer manufacturer be found a monopoly.

The motion to quash is a four-document package from which no adjective was apparently deleted. Supplying the documents requested of Cary would entail production of more than five billion pages from 2,000 separate locations in more than 120 countries; to do so would cost 62,000 man-years and \$1 billion, IBM's quash memo stated.

"It is difficult to conceive of a single piece of paper within [IBM] relating to the DP business which would not be called for," IBM said.

"Any lawyer faced with a demand for documents at the very beginning of

this litigation as broad as the instant subpoena would condemn it as beyond reason and as intended to burden and harass," IBM head counsel Thomas D. Barr said in one of the affidavits. "Any person of ordinary intelligence would ridicule alleged professionals awash in such a bottomless sea of paper. Obviously the subpoena is improper and unfair."

Barr went on to call this the government's "continuing effort to prejudice IBM's defense and to end this case in a stalemate by forcing upon IBM impossible and vastly expensive discovery burdens." (Discovery is basically the production of documents to the other party.)

Barr, in the following 20 pages of the affidavit, juxtaposed statements pri-

marily by John H. Shenefield, now assistant attorney general in charge of the Justice Department's Antitrust Division, with events in this trial — now in its fourth year. Shenefield's statements to law groups and congressional hearings call for speeding lengthy litigation by narrowing discovery. The trial events Barr listed generally drew the trial out.

Charges in Memo

IBM's quash memo specifically argued the Cary subpoena:

- Is unreasonable and oppressive because it is aimed at most of the documents in IBM's files and relates to issues on which there has already been substantial discovery.

- Is overly broad.
- "Constitutes an unreasonable search and seizure in violation of the fourth amendment of the Constitution."

- May violate foreign laws which provide for the protection of company secrets.

- Would compel production of documents not yet in existence and effect the disclosure of company trade secrets, considered proprietary information.

In its papers, the government countered:

- The Justice Department has had no discovery relating to Cary since 1974 and this is the period covered by the subpoena.

- IBM has indicated Cary will testify about all the issues in the case and his narrative is expected to be 400 to 500 written pages. Given this, "IBM's claims of burden are gross exaggerations of fact."

- Cary is expected to testify about competition IBM receives from Japanese, communications and semiconductor companies, but there has been no discovery for the government on these points.

The government also protested IBM's claims that this discovery will delay the trial at the time when IBM is presenting its defense. "In spite of the innuendo, Mr. Barr never points to even a single day of lost trial time because of plaintiff's witness-related and court-ordered discovery. Nor can he since all such discovery has proceeded in parallel with the trial in the courtroom," the government said.

The government also rejected IBM's statements that much of the material requested from Cary is available in his testimony in other lawsuits and earlier depositions, noting that in some cases this material has been closed by the courts involved.

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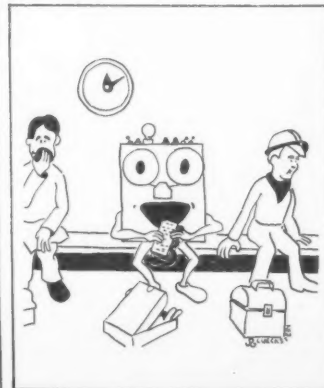
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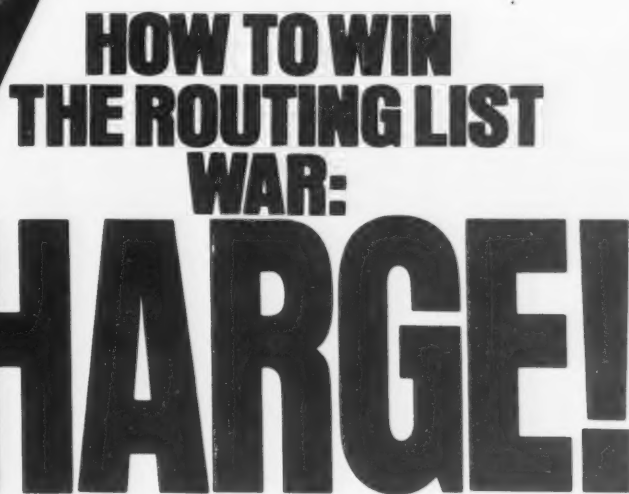
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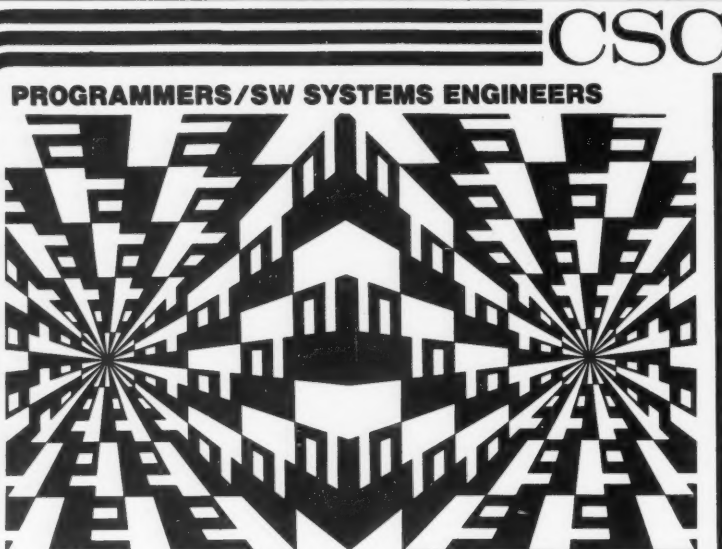
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Our Corporate Headquarters' Technical Publications Department has several positions for qualified writers experienced in data communications documentation. Projects include researching, organizing, and writing communications-related users' manuals, systems analysts' manuals, and data sheets for Wang's Word Processor Systems, Office Information Systems, and Computer Systems.

Candidates should have two or more years technical writing experience with concentration in one or more of the following areas: BSC protocols (including 2780, 3780, 3741, or 3270), SDLC, or SNA. Bachelor's degree required; advanced degree a plus.

These positions offer career opportunities at Wang. We emphasize high quality documentation and provide an excellent working environment with complete hardware/software accessibility. Salary with benefits are competitive. Please submit your resume, including salary requirements, to Linda G. O'Connor, Wang Laboratories, Inc., One Industrial Avenue, Lowell, MA 01851.

Computers

WANG

Word Processing

We are an affirmative action employer

Chicago and Midwest Consulting Opportunities for:

Senior Consultants/Analysts Complex DB/DC based Financial Systems

American Management Systems, Inc. is a systems consulting, software products and computer services firm founded in 1970. Our sales in 1978 were over \$31 million. We have over 700 employees nationally and anticipate doubling our Chicago staff by year's end with continued and sizeable staff expansion in the future. Personal and professional growth opportunities are, and will continue to be, outstanding!

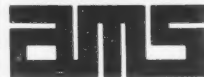
We are seeking "top caliber" senior level consultants who will design and develop large scale systems. Ideal candidates will be qualified in a number of the following areas:

- data base design
- technical direction/management
- generalized support software development
- software packages selection
- data base security; restart/recovery analysis
- software performance
- telecommunication network and hardware analysis

WE ARE ESPECIALLY INTERESTED IN SENIOR IMS DATA BASE DESIGN EXPERTS

Our compensation and benefits package is highly competitive. Interested? Send detailed resume to:

Mr. V.A. Miller
Director, Midwest Recruiting
American Management Systems, Inc.
120 S. Riverside Plaza, Suite 2112
Chicago, Illinois 60606



AMS has the same outstanding opportunities for qualified analysts in our Washington, D.C. office!

AMERICAN MANAGEMENT SYSTEMS INC.

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SYSTEMS ANALYSTS—DATA MANAGEMENT.

There are plenty of places that'll offer you a job. But we offer you more. More money and more opportunity to build an exciting career. With us, you'll be working with real pros in one of Houston's most up-to-the-minute and sophisticated computer complexes.

Plus, we offer too many benefits to explain here. So ask us for the whole story on our liberal savings plan, medical program, company-paid retirement, free life insurance, continuing education, van pooling, 11 paid holidays, sick leave and an annual paid vacation.

Systems Analysts—Data Management.

You'll be responsible for providing technical data management support in application development, computer operations and EDP user community. Implementation and evaluation procedures for data management products are a big part of this job.

Another nice thing is you'll be able to provide technical support in problem-solving areas. A by-product will be the input for standards, guidelines, and a user education plan.

You need a B.A. or B.S. in math, engineering, physical science, or business administration and 4 years' experience with IBM 360/370, OS/MVS operating systems of which 2 years must be with IMS and related data base products. Also language proficiency in COBOL, Assembler or PL-1.

Interested?

Then send us your resume and salary history and we'll get back in touch with you. Aramco Services Company, Section DOM, Dept. CPW0402L, 1100 Milam Building, Houston, Texas 77002.

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HOUSTON



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TULSA

Tulsa is a dynamic city with good opportunities for experienced programmer analysts. Opportunities in business and scientific applications.

Salaries to upper \$20's.

2624 E. 21st St. Tulsa, OK 74114
(918) 747-3621

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Our clients need systems software experience on DOS/VS CICS; OS/MVS, IMS DB. Salary to mid-\$20's.

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Ft. Worth, TX 76102 (817) 336-4565

**DATA PROCESSING
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KANSAS CITY

IMS Software	25k
MVS Software	25k
Mini Software	24k
IMS, P/A	24k
COBOL P/A	22k
BAL, P/A	22k
Mini, P/A	22k
RPG II P/A	22k

6405 Metcalf Shawnee Mission
Kansas 66202 (913) 236-8288

**DATA PROCESSING
CAREERS** inc.

DALLAS

CICS Systems Programmer 370/158 OS/VS1 firm needs person to take charge of this area. Salary low to mid-\$20's. 'People-oriented' company, good benefits, nice location. Let us represent you for this position.

Suite 1109 Stemmons Tower W
Dallas, TX 75207 (214) 637-6360

**DATA PROCESSING
CAREERS** inc.

**Programmer
Analyst**

IBM 370/3033 Litton Bionetics, Inc., a leader in biomedical research has immediate openings in our expanding Information Systems Dept. for Programmer Analysts with minimum 3 years experience in business (Cobol) and scientific (Fortran) applications. Convenient suburban Maryland location close to Washington D.C. Excellent salary and benefits including liberal educational assistance. Please direct your resume and salary history to: Employment Manager, Litton Bionetics, Inc., 5516 Nicholson Lane, Kensington, Md. 20795 EOE M/F.

**AGA ASSOCIATES
MIAMI, FL.**

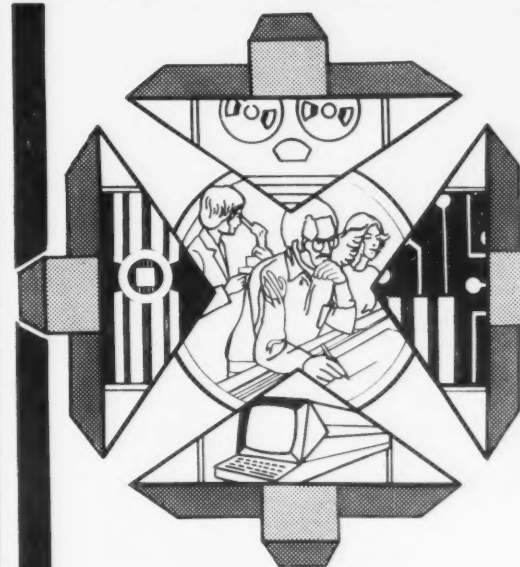
Mgr. Bus. Systems	28K
Data Base Analysts	28K
Systems Analysts	26K
OS/DOS - Systems Programmers	26K
International Consultant	25K
EDP Auditor	25K
Prog. Analysts	24K
Prog. Analysts (Banking)	22K

The above represents a sample of Fee Paid opportunities available.

TELEPHONE: (305) 561 2811
23 N.W. LEJEUNE ROAD
MIAMI, FLORIDA 33126

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on the San Francisco Peninsula,
where individual achievement
is a result of teamwork.

We'll use all of your imagination, because problem solving and creativity are what Lockheed Missiles & Space Company is all about. Our diverse product areas include advanced spacecraft, fleet ballistic missiles, communication satellites and electro-optical R&D. Opportunities exist in the following areas:

Administrative Programmers

- Openings for experienced Administrative Programmers to work on large scale applications. Integrated systems involving both real-time and Batch processing. Areas of work include Financial, Manufacturing, Engineering, Procurement, and Logistics Systems. Minimum requirements are a Degree and two years' experience in Administrative Applications.

- The IMS Systems Software group needs individuals with experience in maintaining IMS/VS on the IBM 370/168 under MVS. Keeping current with new developments while maintaining a stable system for production support is our primary challenge.

- Systems Programmers experienced at assembly language level with knowledge in any one of the following systems software areas: Operating Systems, Communication Teleprocessing; Interactive Systems and Associated Languages; Utilities and Space Management; Security and Privacy Systems; Real-Time Transaction Drive Systems; and Systems Programmers to perform technical documentation.

N/C Systems Software

Assist in the installation, modification, maintenance, and development of numerical control software on the Univac 1100/43. Will work on APT system software and on post processors. Work experience must include numerical control systems software. Experience may be in design and development, or installation and maintenance. Requires three to seven years' experience and an appropriate degree.

Scientific Programmers/Analysts

- Openings available to analyze scientific and engineering problems and develop electrical analogies and/or numerical models for their solution on digital computing equipment. Three years of related experience in the fields of scientific programming, engineering, mathematics, or numerical analysis.

- OTHER OPPORTUNITIES EXIST TO analyze requirements and design and develop display software for command and control of a real-time weapon system. A minimum of four years' experience in software design/development with emphasis on FORTRAN language for scientific applications.

- WE ALSO HAVE OPPORTUNITIES TO provide technical assistance to the U.S. Air Force in acceptance, development and review of software products utilized in support of mission requirements with the Satellite Control Facility. Requires three years' experience in Satellite operations.

- OPENINGS ALSO EXIST TO define requirements for graphics software group, providing technical counseling and programming required to support interactive graphics using CADAM (Computer-Augmented Design and Manufacturing). Four to six years' in field of scientific programming, engineering, or numerical analysis.

We promote innovation

Come, explore the vast opportunities and rewards awaiting you now. Send your resume indicating area of interest to Professional Placement Manager, Department CW-49, P.O. Box 504, Sunnyvale, CA 94086. We are an equal opportunity affirmative action employer.

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MISSILES & SPACE COMPANY

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System Programmers IMS-VS/TSO/VTAM

Dallas Openings

Opportunities

Texas Instruments needs experienced System Programmers to help maintain one of the largest data processing installations in the country. Immediate opportunities exist in support areas for both IMS and TSO in an MVS/JES3 environment.

Location

Live in Dallas. The Southwest's largest and liveliest metropolitan area. Discover all the glitter and glamour, spectacular sports and high fashion. Dallas is famous for—yet an economical place to make home. Cost of living is below the urban U.S. average. And there's no state or local income tax. Dallas and the surrounding area has 47 colleges, 50 hospitals, 2 major medical education and research institutions, and a wealth of major media and entertainment.

Challenge

If you are interested in working in a professional and more challenging organization and have a 4-year college degree with 2 years' experience with similar software systems, then call collect to John Heft at (214) 238-3275 or send your resume in complete confidence to: John Heft/P. O. Box 2103/Richardson, TX 75080.

TEXAS INSTRUMENTS
INCORPORATED

An equal opportunity employer M/F

PROGRAMMER ANALYSTS

Denver, Colorado

Samsonite Corporation has an immediate need for Programmer Analysts who have manufacturing and financial systems experience.

If your background also includes COBOL, CICS, BAL, IDMS or other data base experience, Samsonite Corporation can offer you a rewarding career opportunity working in our teleprocessing environment. Your initial responsibilities will be in heavy applications programming, working into systems design and project leadership.

System analysis skills and project management experience would be helpful.

We offer a competitive salary and benefits program which includes paid relocation. Please send your resume, salary history and requirements to Patti Grinnell:

SAMSONITE CORPORATION

11200 E. 47th Avenue
Denver, CO 80239

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DataCommunication Professional Opportunities

Visit our Hospitality Suite
During Interface '79

As a recognized leader and pacesetter in the manufacture of Modems and Multiplexers in the country, we have a need for additional dynamic professionals to help us continue our successful growth record (54% growth for the year ending September 1978) in the following responsibilities:

PRODUCT MANAGERS

Danbury Based

We have openings in the Product Management organization for individuals with the following responsibilities:

- The foreign marketing strategy
- Develop product definition and specifications
- Coordinate and guide development efforts
- Determine sales directions

Successful applicants will have a technical degree; experience in sales or product management; an in-depth knowledge of data communications and an ability to work independently as well as with engineering and manufacturing management. Specific experience with analog modems 300 BPS-9600 BPS; base band modems, hardware multiplexers; programmable concentrators/front ends and data test equipment desirable. Senior and Intermediate positions available.

DISTRICT SALES MANAGERS

Openings available throughout the U.S.

The candidates we seek should possess at least 5 years sales experience (of which at least 2 years have been spent in a managerial position), preferably in the data communications industry. A thorough knowledge of data networks and the application of Modem and Multiplexing equipment. Will be responsible for own territory; handling direct sales to major accounts; supervising sales engineers; and managing distributors/manufacturers reps. Ideally, these individuals should currently be in a sales management position with a terminal manufacturer.

SALES ENGINEERS

Openings available throughout the U.S.

Should have a minimum of 2 years sales experience plus a thorough knowledge of data communication systems. The selected candidate will be assigned to a specific territory and will be responsible for the sale of modems, multiplexers and diagnostic systems to the end-user community.

APPLICATION ENGINEERS

For these positions, we need individuals with some related experience. After assignments to a Regional Area, will provide support to District Managers and Sales Engineers. This involves technical assistance to sales personnel, preparation and presentation of field proposals and providing systems analysis to customers.

The successful candidates will find highly competitive starting salaries based on background and qualifications, comprehensive company paid benefits and profit sharing.

To find out more about these openings, you are invited to our
**HOSPITALITY SUITE, APRIL 9 through APRIL 11, at the
CONRAD HILTON HOTEL & TOWER**
720 South Michigan Avenue, Chicago

If unable to visit us in Chicago, please forward a resume indicating position desired and including salary history and requirements, in strict confidence to: Mr. George Naspo



**General DataComm
Industries Inc.**

One Kennedy Avenue
Danbury, Conn. 06810

An Equal Opportunity Employer. Male/Female

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Data Communications R&D OPPORTUNITIES

Visit our Hospitality Suite During Interface '79

We are a fast-growing major force with the widest product line in the Data Communications Industry. Due to our 54% growth in sales last year, we have openings throughout our R&D Engineering Department.

GROUP

Low/Medium Speed Modems
High Speed Modems
Time Division Multiplexers
Network Diagnostic and Control Systems
Test Engineering
Power Supplies
Components

R&D POSITIONS

• Principal Engineer • Project Engineer • Senior Engineer • Engineer
• Principal Engineer • Senior Engineer • Engineer
• Project Engineer • Senior Engineer • Engineer
• Senior Project Engineer • Project Engineer • Senior Engineer
• Senior Principal Engineer • Senior Engineer • Engineer
• Senior Project Engineer
• Evaluation Engineer

Based at our modern facility in Danbury, Connecticut, these highly visible positions offer excellent salaries and growth opportunities.

To find out more about these openings, you are invited to our
**HOSPITALITY SUITE, APRIL 9 through APRIL 11, at the
CONRAD HILTON HOTEL & TOWER**
720 South Michigan Avenue, Chicago



General DataComm Industries Inc.
One Kennedy Avenue
Danbury, Conn. 06810

An Equal Opportunity Employer, Male/Female

If unable to visit us in Chicago, please forward a resume indicating position desired and including salary history and requirements, in strict confidence to:
Mr. George Naspo.

Technical Support Specialist FINANCE SYSTEMS

We are a diversified manufacturer with 10 operating companies and 1978 sales over \$2 billion. Our Finance Systems Group is a rapidly expanding area responsible for providing our Corporate Finance Department with integrated information systems. We are adding a new position—Technical Support Specialist—which will provide technical assistance in the development, implementation and operation of financial systems and serve as technical liaison between the Finance Department and the Management Information Services Department.

We are seeking an individual with a BS/BA in Computer Science, and a strong background in the design and implementation of financial systems. An MBA in Finance and/or supervisory/managerial experience would be strong pluses.

For consideration, send your resume and salary history to:

Personnel Manager

Northwest Industries, Inc.
6300 Sears Tower Chicago, Illinois 60606

An Equal Opportunity Employer M/F

MODLINE the "Un-hardware" Company

MODULAR ONLINE SYSTEMS COMPANY (MODLINE) is an organization of dedicated computer programming professionals successfully pursuing projects covering the entire spectrum of computer technology: micro-processors, mini-computers, communications processors, business systems, data base applications, and time sharing.

We are presently seeking experienced career oriented

BUSINESS ANALYST/ PROGRAMMERS

responsible for analysis, design and programming utilizing RPGII, COBOL, and BASIC Languages.

ELECTRICAL ENGINEER

Responsible for analysis, design and programming utilizing BASIC, FORTRAN, PASCAL and ASSEMBLER languages.

Our modern facilities are located in the heart of the beautiful Pacific Northwest. We offer an excellent working environment and employee benefits package.

Be a PROFESSIONAL in your chosen field. Join one of the fastest growing computer software corporations.

Please reply with resume including desired salary requirements to: MODLINE, 3836 N. Ballast, Portland, OR 97217.

SENIOR SYSTEMS ANALYST CICS-COBOL

In order to meet the needs of our expanding INFORMATION SYSTEMS area, M&T Chemicals Inc. is seeking a SENIOR ANALYST for our Rahway, New Jersey facility.

This individual while maintaining current business systems will actively participate in the design, development and recommendation of new systems for a growing client population.

A bachelor's degree or equivalent in Computer Science with 2-4 years of meaningful experience is required. A comprehensive background in COBOL, CICS design/programming, IBM OS JCL and utilities and structured design and programming are also required.

We offer a highly professional atmosphere in which to grow, a superior benefits package including tuition reimbursement, and an excellent starting salary. Please send your resume and salary requirements in strictest confidence to: M&T CHEMICALS INC. Dept. A-Z, P.O. Box 1104, Rahway, New Jersey 07065.

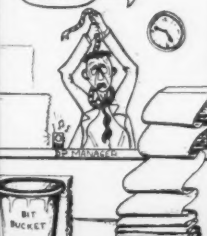
**M&T
CHEMICALS INC.**

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"I'LL NEVER MEET THESE DEADLINES! HALF OF MY STAFF IS LEAVING, THE OTHER HALF IS OVERWORKED. WE NEED QUALIFIED PEOPLE AND WE NEED THEM IN A HURRY!!!"



"WAIT! AS USUAL, YOUR SUPER EFFICIENT SECRETARY HAS THE ALLEN SERVICES #1 HANDY: 800-543-7583. ASC CAN PROVIDE THE EXPERTISE YOU NEED TO GET THIS JOB DONE. WE DON'T HAVE TO WORRY ABOUT ADVERTISING RELOCATION FOR THE PROGRAMMERS ON THEIR CONTINUED EMPLOYMENT AFTER THE ALLOTTED TIME. ASC DOES IT ALL!"



"NOWAY FOLKS! IN YOUR SITUATION YOU OUGHT TO CONSIDER STAFF COMPLEMENTING. OUR FINE PROGRAMMERS CAN PROVIDE THE TECHNICAL KNOWHOW TO GET YOUR JOB DONE AND STILL MEET YOUR DEADLINE. ALSO, ASC GIVES YOU THE OPPORTUNITY TO MAKE ANY OR ALL OF THEM PERMANENT EMPLOYEES AFTER THE ALLOTTED TIME."



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"MRS. MACLEROY, SEND THIS INFORMATION TO ALL OF OUR OFFICES FROM NOW ON, FOR ALL CONTRACT PROGRAMMING WE'LL GO TO ASC. CALL TOLL-FREE: 800-543-7583. IN OHIO CALL COLLECT: 513-890-1200 FROM 8:00AM TO 8:00PM."



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DATA COMMUNICATIONS MANAGER, PRODUCT DESIGN

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Telenet, the industry pacesetter in packet-switching technology, is already at work on the next generation of systems to meet the challenge of the eighties. Join us and share in our success as you help develop these solutions, working with the top scientists and engineers in this exciting new field.

OPPORTUNITY IN WASHINGTON, D.C. METROPOLITAN AREA

We are seeking a highly energetic individual with a technical background in asynchronous and synchronous communications. Working knowledge of packet-switching technology, CCITT Recommendation X.25, and systems programming. Responsibilities will include:

- New network products design
- Acceptance testing
- Product documentation

Telenet offers attractive salaries, excellent working conditions, complete fringe benefits and outstanding professional growth opportunities.

Send resume including salary history, in confidence to: Director of Personnel



Telenet
Communications Corporation

8330 Old Courthouse Road
Vienna, VA 22180

An Equal Opportunity Employer M/F/H

Systems Software Analysis

Seeking to broaden your technical expertise? If you're bright, ambitious and eager to work in a highly sophisticated state-of-the-art environment, Burndy can offer you plenty of growing room.

Our requirements are pretty open. You should have some experience with software systems, but most importantly, you should be a real go-getter, anxious to grasp all the technical knowledge our stimulating projects can offer you. Our advanced OS environment includes an on-line integrated data base accessed through a nationwide communications network. Your assignments include working on OS & DBMS internals, hardware evaluation, systems performance monitoring, and new software development projects. In addition, we will train you on our UNIVAC 1100/80 computer system.

Burndy is a successful, multi-national organization producing a broad line of electrical/electronic connectors for virtually every industry. Find out more by sending your resume with salary history to Mr. Earl Skinner, Manager, Recruiting & EEO Affairs, Ref. CW

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You'll live better when you work for Koppers in Maryland.

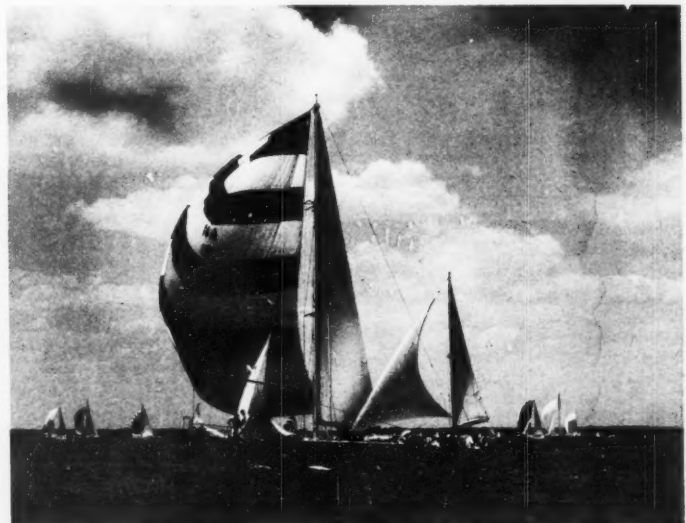
Koppers combines the best of both worlds: a progressive company with \$1.5 billion in annual sales, full of challenging projects and career opportunities, and a location on the Chesapeake Bay. Here, you're within convenient access to the great universities, libraries, museums and cultural activities of the nation's capital and the rolling green of Maryland horse country; the lush scenic beauty and wintertime sports of the nearby mountains, the Atlantic beaches, and the famous fishing, sailing, swimming and seafood treasures of the Chesapeake Bay.

The Engineered Metal Products Group is looking for Programmer/Analysts, a Systems Programmer, Project Leaders, and a Manager of Systems Development. The environment is excellent with an IBM 370/138, DL/1, CICS/VS, SPM, communicating via 3705 to RJE terminals, local and remote CRT's and an IBM 8100 scheduled for late 1979. Projects planned or in process include: MRP, Shop Floor Control/Capacity Planning, Data Collection, On-Line Order Entry, Standard Costs, and Group Technology.

We offer excellent salary, on-the-job training and educational assistance, and benefits including medical, dental, life insurance, retirement, and stock purchase plans. If you're interested, contact: Douglas Macnab, Manager, Group Industrial Relations, Koppers Company, Inc., P.O. Box 298, Baltimore, MD. 21203, 301/368-6828.

KOPPERS
Engineered
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EDP CONSULTING MANAGERS (HEALTHCARE ENVIRONMENT)

We stand out for our pre-eminence in the consulting field. Our clients are broad-based and the challenges they provide demand unique capabilities from our professionals. Delivery on these challenges - on-time and on-plan - accounts for our position in the market place, our growth and our current search for the right professionals.

Our interest is in candidates with significantly responsible and comprehensive healthcare backgrounds to assume positions at the management level of our EDP consulting practice for clients in the healthcare sector throughout the country. Hands-on experience in design and implementation of all types of financial and clerical systems, software analysis and design, comparative hardware analysis are necessary requirements for these positions.

You will use outstanding technical competence and skill in interfacing with top management in implementing healthcare EDP services. Your background must be healthcare related with a successful work history (5-10 years of experience) acquired in a shared data processing service, equipment manufacturer, major hospital and/or a consulting environment.

This is an exceptional opportunity offering the seasoned professional an option to evolve into partnership in our firm. Demand for our services makes it possible to offer you a highly visible role with key business development responsibility.

Talk to us first.

Resumes (specifying geographic preference) should be sent to Howard Hagerman, 3 Girard Plaza, Philadelphia, PA 19102. All correspondence will be held in strict confidence.

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Leeds & Northrup is a world leader in the design and engineering of state-of-the-art computerized process control systems for electric power utilities and a wide range of heavy industries. In fact, we are considered to be the "Cadillac" in our field.

• Ours is a rapidly growing industry. The steady advance of industrial technology, and the need to improve productivity and quality control, while conserving energy and protecting the environment, has made it imperative that companies produce their products in the most efficient manner possible. This is why so many companies are turning to process control systems ... and the Leader: Leeds & Northrup.

• Leeds & Northrup maintains its position in the technological forefront by being first to apply the latest advances in circuitry, components, and systems engineering ... and by creating technological breakthroughs of our own.

• As a L&N scientific programmer or software manager, you will be part of a dynamic project team, where

you will learn a great deal from senior members and interface with other groups in engineering, hardware, software, and applications.

• Long-term projects (average length, 18-24 months) with equally rewarding projects to follow, assure you of a continuous stream of career-building assignments and exceptional job stability. Working in this way allows you to see the results of your efforts and provides a deep sense of pride and personal accomplishment. Your individual contribution to the team effort will be recognized and you will have high visibility to management.

• Leeds & Northrup's Systems Group, and Applications Training Programs permit you to see the pace of your training and degree of expertise. It's as simple as this: the harder you work, the more you apply your talents to the task at hand, the quicker you will grow to take on greater responsibilities. Make no mistake, L&N promotes strictly on demonstrated ability—not seniority. This means that you will be promoted over those who, although they have more time with the company, do not have your abilities.

• Leeds & Northrup offers highly competitive salaries and benefits. But we don't stop there. To make certain that your responsibilities and earnings keep pace with your accomplishments, we have a Short Cycle Evaluation Program (SCE) that assures you of performance and salary reviews throughout the year and unlimited visibility.

• Leeds & Northrup is located in an ideal suburban area offering excellent housing, public schools, and universities. The cultural centers of Philadelphia and the recreational attractions of the mountains and seashore are also within easy driving distance.

FOR COMPLETE INFORMATION ABOUT YOUR FUTURE WITH LEEDS & NORTHRUP, CONTACT JIM HENDERSON, OUR MANAGER OF PROFESSIONAL EMPLOYMENT. HE'LL TALK TO YOU ANYTIME, DAY OR NIGHT... WEEKDAY OR WEEKEND. JUST CALL (215) 643-2000, EXTENSION 2010. OR SEND YOUR RESUME TO: JIM HENDERSON, SYSTEMS GROUP, DEPT. CLN49, LEEDS & NORTHRUP, DICKERSON ROAD NORTH WALES, PA 19454

An Equal Opportunity Employer M/F

SCIENTIFIC PROGRAMMERS SOFTWARE MANAGERS

Typical assignments will involve:

SYSTEMS SOFTWARE

Design and integration of operating systems and software development

MAN/MACHINE INTERFACE

CRT graphics, loggers, operator's panels

APPLICATIONS

Electric power applications, both systems control and plant performance monitoring; Waste Water, CFI and other industrial applications

COMMUNICATION

Data acquisition, control output, computer-computer communications

SUPPORT PROGRAMS

Data base generators, display compilers, source editors, general utilities

Preferred backgrounds will include a B.S. degree in Engineering, Mathematics, Physics, or Computer Science and 2-5 years of hands-on related experience, with at least one year of FORTRAN in a scientific programming environment. Electric power experience in supervisory control, data acquisition, or automatic generation control is an asset, as is a knowledge of ASSEMBLY.

SOFTWARE DEVELOPMENT MANAGER

This line management position is responsible for 15-20 programmers; developing real time minicomputer operating systems and related software and application programs and operating systems for microprocessor based I/O and MMI devices. You will participate in overall new product definition and planning and should have project and line management experience in a programming environment.

SYSTEM TEST ENGINEERS

Step up to large scale systems. They consist of in-house and OEM computers with I/O peripherals, video and communications equipment. Your job is to integrate the equipment and make it run. NO TRAVEL.

PRODUCT SUPPORT ENGINEER

A major portion of this position involves marketing and sales support; data sheets, presentations, market forecasting, shows, etc. However there is substantial participation in coordination of engineering and manufacturing of new products. Technical degree required.

Important Facts You Should Know About LEEDS & NORTHRUP



LEEDS & NORTHRUP
A UNIT OF GENERAL SIGNAL

Dept. CLN49, Dickerson Road,
North Wales, PA 19454

technology is our environment

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CALL 800 621-2184

CALL (toll free) 800 621-2184
Illinois residents call (312) 977-1555

It is no longer necessary for you to cope with speculative statistics to evaluate your salary status. One of America's most prestigious research firms has made available to each of our NCA offices a professional survey that authenticates data processing salaries in the Metropolitan Areas of: Boston, Chicago, Columbus, Dallas, Denver, Detroit, Hartford, Kansas City, Los Angeles, Miami, Milwaukee, Minneapolis/St. Paul, Newark, New York, Philadelphia, San Francisco, Seattle, Washington, D.C., The Carolinas, and Upstate New York.

To get the survey for any of the aforementioned areas, call 800-621-2184, toll free. Illinois residents call (312) 977-1555. Each office has a large copy of the complete national survey that you can examine by visiting the office nearest to you.

National Computer Associates

Constantly Growing Stronger.



DATA PROCESSING PROFESSIONALS EDUCATIONAL TESTING SERVICE

Rosedale Rd.
Princeton, N.J.
is seeking:

PROGRAMMING ANALYSTS

Mid-level, with BA degrees + 2 yrs. COBOL programming, and senior-level, with BA degrees + 4 yrs. COBOL programming.

SYSTEMS ANALYSTS

Senior-level, with BA degrees and 4 yrs. experience on IBM 370/OS/V5. Data base mgt. on-line application CICS, project mgt., production control, and performance measurement all pluses.

SYSTEMS PROGRAMMERS

Senior-level, with BA degrees and 7 yrs. experience in analysis programming and maintenance of operating systems. Must know Assembler language, COBOL, IBM virtual storage operating systems, MVS, CICS, JES2, HASP4 helpful.

These are ground floor opportunities in a dynamic environment with twin 4-meg, 3031's, TSO for programmers, and new 3800 printer. Competitive salaries, excellent benefits, in-house training.

Send resume to:
George Dombroski,
Sr. Placement Specialist
Affirmative Action Employer.

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• Sr. Scientific Programmers/Analysts
• Mini Computer/Real Time Programmers
• Systems Specialist & Data Base Professionals
• DPM's, Operations Mgrs. & Project Mgrs.

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HONEYWELL COMPUTER SPECIALISTS

Fruehauf Corporation, with annual sales over \$2 billion, is the leader in the truck trailer industry. In order to keep pace with the expanding information requirements of the company, a dual processor Level 66/40 system was recently installed at our headquarters in Detroit, Michigan, and a number of Level 6 minicomputers are being installed at different manufacturing facilities, located primarily in the Midwest.

We are seeking experienced computer professionals who have prior successes and desire challenging projects that concentrate on data base and data communications.

The Level 66 software consists of the GCOS Operating System, DMIV, IDS-II Data Base, NPS, Cobol 74, TOSC-4, and Sarah-H. The Level 6 software consists of Mod 400 Operating System, DEF, TCF, RBF, and Cobol.

MANAGER OF TECHNICAL SUPPORT

Supervision of the Detroit staff of technical support programmer/analysts. Technical background in operating systems, data base and data communication software required.

TECHNICAL SUPPORT PROGRAMMER/ANALYSTS

Individuals experienced in either GCOS operating systems, Honeywell data communications software, or data base, for Detroit support of both Level 66 and Level 6 systems.

APPLICATIONS PROGRAMMER/ANALYSTS

Individuals to develop a wide variety of marketing, manufacturing and financial applications for the Detroit Level 66. Also, individuals to develop manufacturing applications for the Level 6 systems, either resident in Detroit or at our manufacturing facilities.

These positions include excellent salaries and an attractive benefits package. Please send your resume to:



Personnel Manager

FRUEHAUF CORPORATION

10900 Harper Avenue
Detroit, Michigan 48213
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PROGRAMMERS

Racal-Milgo, Inc., headquartered in South Florida, is a world leader in the data communications field. In order to keep pace with our record sales and continued growth, we have opened career opportunities at all levels for Programmers.

SOFTWARE DEVELOPMENT

SYSTEMS PROGRAMMERS - These positions involve systems design and development of communications networks, familiarity with PDP-11, RSX 11M, RT 11 and microprocessor based systems. Intel 8080, 8085 experience desired.

REAL-TIME APPLICATIONS PROGRAMMERS - Responsibilities include functional design and implementation of application related to the control of communications devices. This software will perform switching and controlling of communications network systems.

APPLICATIONS PROGRAMMERS - Should have a minimum of 2 years real-time assembly language experience in mini-computers, or microprocessors, communications, teleprocessing, remote batch, IBM 3270/2260, Uniscope 100/200/400, VIP 7700 exposure helpful.

ENGINEERING PROGRAMMERS - Your involvement will include microprocessor operating systems design, communication software development, real-time software design, compiler design, terminal development, multiplexer software design.

MANAGEMENT INFORMATION SYSTEMS

BUSINESS SYSTEMS ANALYST - Individual must be able to analyze the broad MIS needs of the company and recommend new and improved systems designs to management. Duties include design of business systems, whether automated or manual, from the feasibility studies through post implementation audits. This position requires a minimum of 5 years broad systems experience, preferably in an environment utilizing a phased approach to a systems design and a large computer system.

SYSTEMS PROGRAMMER - Must be experienced in implementing and maintaining Univac 1100 series operating systems. Responsible for implementing, enhancing, and maintaining DMS 1100, COBOL, QLP and other related software on a large Univac 1100 with multiple applications.

SYSTEMS SPECIALIST - Individual should have 3-5 years systems analysis and programming experience with business applications utilizing ANS/COBOL. Experience in Univac 1100 series and degree preferred.

DATA BASE ANALYST DESIGNERS - Duties include analysis design and development of data bases for both batch and on-line applications utilizing DMS 1100 data base management systems. You will also be responsible for training, consultation, performance measurements and optimization of data base design.

Send your resume in confidence to Rod Manning c/o:

RACAL-MILGO, INC.
8600 N.W. 41st Street,
Miami, Florida 33166
Telephone (305) 592-8600

PROGRAMMER ANALYSTS

California

There's a lot going for you in California and it's all good. Good weather, good living conditions, good cultural and leisure time activities and a very good working environment and career growth opportunity with the latest state-of-the-art techniques.

We have a major systems development program in progress that is committed to developing advanced banking systems. Our systems involvement include time-sharing, personnel/payroll, trust and investment systems, commercial loans, mortgage loans, revolving credit, corporate services, international banking, branch automated systems in a highly professional environment. We are seeking PROGRAMMER ANALYSTS who have above-average credentials and would like to embark their careers in our long term banking systems development program.

If your background includes solid COBOL programming experience on large scale IBM equipment with proven design level skills, and you're ready to advance your career in a highly challenging environment then send your resume to:

MS. LIZ WANTUCH, Employment Department CW 4/9
CROCKER NATIONAL BANK
155 Fifth Street, San Francisco, California 94103



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Get involved with sophisticated and challenging management systems projects. Work with the latest in operating systems on large-scale Honeywell equipment. Our computer environment includes a dual processor 66/60, communications network processors, and distributed minicomputers.

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SYSTEMS PROGRAMMER

The Union National Bank of Pittsburgh has an immediate opening in its very progressive DP department for an experienced OS/MVS systems programmer using dual 3031 processors. The position involves responsibility for the operating system from SYSGEN through maintenance and enhancement cycles.

The successful candidate will participate in systems software evaluation and installation, internal consulting on teleprocessing techniques and systems development, problem determination, and technical support to the entire DP organization.

We offer excellent growth opportunity, a full range of benefits, and an excellent starting salary. Please send resume including salary requirements in confidence to:

The Union National
Bank of Pittsburgh
P.O. Box 837
Pittsburgh, PA 15230
Attention: A. W. Hogeland
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SYSTEMS PROGRAMMER

Interested in working in a challenging and educational environment? Texas A&M University has positions open for systems programmers to assist in software systems conversion from SVS to MVS, and to work with HASP, IMS, WYLBUR, TSO, and APL on an AMDAHL 470 V/6. Texas A&M University, a co-educational institution with a current enrollment of 30,000 students, is located in a rapidly growing community 90 miles northwest of Houston. Conducive to many extracurricular activities and sports, the local climate ranges from an average monthly temperature of 44 degrees in January to an average of 86 degrees in August. Successful applicants will have a challenging position, competitive salary, excellent living conditions and the opportunity to further their education. Qualified applicants should send resumes to:

Employment Manager
Personnel Department
Texas A&M University
College Station, Texas 77843
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Infotech International Incorporated is looking for the right persons to train its clients' D. P. Staff in Infotech Programming Technology (IPT).

Requirements:

- Minimum of 2 years in D. P. Programming
- D. P. training background
- Previous training in or experience with IPT or Jackson Design Methodology

Infotech's trainers and educators present Infotech's IPT training throughout U.S.A. and Canada.

Please submit resume to Infotech International Incorporated, 234 East Colorado Blvd., Suite #329, Pasadena, California 91101. (213) 793-0687.

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Statistical Analyst with strong D.P. background to design and implement statistically oriented A/R system. Will require math abilities and/or skills as well as at least 2 years D.P. systems analysis experience. Send resume and salary requirements to Personnel Director, Bear Creek Corporation, Box 712, Medford, Oregon 97501.

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Capable of performing immediately in an OS/VS1 environment with CICS and IMS. Must have two years or more experience in OS/VS1 internals and in either CICS or IMS internals. Please send resume and salary requirements to:

HAWAII MEDICAL SERVICE ASSOC.
P.O. Box 860, Honolulu, HI 96808
ATTN: Personnel Department
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EDP SOFTWARE PROFESSIONALS



NCR/San Diego is making the big moves.

We have room for professionals with ideas that are big enough to spawn new divisions.

THINK BIG aptly describes the way we develop and implement new concepts at this pace-setting NCR facility. We design and build large-scale computer systems — with a difference. Our bold thinking pushes the state-of-the-art to anticipate the EDP needs of business in the 1980s. That boldness leads to the kind of major developments that have twice warranted setting up company divisions for new products.

Where we're headed . . . We have several major projects in work. One is our new virtual resource executive — a powerful system that combines COBOL with virtual operation. Another is a system which will provide interactive transaction processing capability for our virtual mainframes. And in the design process, we're looking for new approaches to software, firmware and testware development. On top of that, we're moving rapidly into VLSI technology with the support of NCR's own micro-electronics facilities.

We're big on resources . . . You need lots of high calibre equipment and technical support to take on projects of the magnitude we handle. You'll be working with our most powerful, new generation Criterion mainframes, the latest advances from our data communications divisions, a highly interactive battery of technical support specialists. And you'll have it all at hand in a plant-complex big enough to house your grandest ideas.

. . . but small in modus operandi We keep our project teams small. You work intimately with a few heavyweight professionals. That means you come to grips with more of the problem, share more of the responsibility. It also means that everyone carries his or her full weight and stands out with high visibility.

Outside — the good California life . . . Our pioneering development groups are at home in Rancho Bernardo, 22 miles up the coast from San Diego. Our 114-acre hilltop location has been called "one of the 10 best-designed facilities in the nation." You'll be in the midst of California's finest recreational facilities, including 70 miles of beaches from San Juan Capistrano to the Mexican border. You'll work where others come to vacation.

Are you attending the Interface Show in Chicago, April 9 through 12?

If you are, call one of our representatives at (312) RA 6-9638 for a one-on-one briefing of current openings as listed. Or send your resume and salary requirements to: Tim McEwen, Placement Specialist, NCR Corporation, Engineering and Manufacturing, Department S50, 16550 W. Bernardo Drive, San Diego, California 92127.

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Immediate openings in many areas:

If you have an engineering or computer science degree (or equivalent) and a year or more of experience in one or more of the areas listed, contact us at once.

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 - Interactive Processing
 - Data Base Design
 - Performance Evaluation
 - Systems Modeling
 - Time Sharing Systems
 - Distributive Systems
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 - Compiler Design/Development
 - Firmware Development
 - Diagnostic Programming
 - Test Systems Development
 - Telecommunications Systems
- Programmers
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Distributed Processing
Bit Oriented Communications
Communication Emulation
Communication Stress Testing
New Product Definition Development
- Systems Architecture
 - Tools Support
 - time-sharing—compiler designs/developments (high-level block structured languages)—SW tools design
 - Distributed Intelligence Architecture/Interactive Systems
 - Software Architecture
 - Fifth Generation OS Architecture/Interactive Systems Software Architecture

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Complete Computer Systems

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Excellent opportunity for advancement in systems consulting. Experience in B-1860 and IBM Sys. 3. On line and data base systems knowledge helpful. B.S. degree. Starting salary to \$22,000. Please submit resume, in confidence, to Dataman Corp. 1807 Capitol Ave. Cheyenne, WY 82001.

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Managing Partner

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KUWAIT**PROJECT LEADER & TWO PROGRAMMERS
FOR LARGE COMMERCIAL BANK**

Gulf Computing Systems, a leading Data Processing consulting firm, based in Kuwait, is seeking three Data Base experts for the second phase of a Letters of Credit Processing system for one of their major banking clients. Applicants should have the following qualifications.

PROJECT LEADER

- 5 - 10 years Assembler/CICS experience
- In-depth knowledge of Assembler language
- DL/I Experience
- Good general banking background. Knowledge or experience of Import Letters of Credit is a definite plus.

PROGRAMMERS

- 3 - 5 years Assembler/CICS
- DL/I Experience
- Some banking experience preferred.

The duration of this project will be 12 - 18 months. Salaries will be commensurate with experience but will be in the region of \$50,000 - \$60,000 p.a. Successful applicants will be given assistance in finding suitable housing for themselves and their families. Interviews will be conducted in late April.

Applications in writing to Charles Allen, Managing Director, Gulf Computing Systems, P.O. Box 396, Barrington, Illinois 60010.

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- 3 to 8 years COBOL; experience with finance, payroll, personnel or sales and marketing applications; knowledge of distribution, insurance, medical, pharmaceutical or statistics helpful.

Join Revlon's top notch computer professional team. Build your experience working with sophisticated "state-of-the-art" hardware and user applications. Receive an attractive salary and benefits package that reflects and keeps pace with your abilities. Put yourself on a fast track career path at a company whose extraordinary growth demands achievement and rewards it well. Send resume including salary history to

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REVLON

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Systems Analyst: Bachelors in Computer Science or related field, four years programming or systems analyst experience, ability to train and supervise staff in complex business problems, starting salary approximately \$18,000/year.

Project Leader: Bachelors in Computer Science or related field, five years programming or systems analyst experience with at least two years as systems analyst. Good supervisory and training skills a must, starting salary approximately \$20,000/year.

Programmer Analyst: Bachelors in Computer Science or related field. Two years programming experience, ability to train and supervise staff in complex business problems. Starting salary approximately \$15,000/year.

or

Any Equivalent Combination of Education and Experience

Application Information: Apply at the Weld County Personnel Department, 915 10th Street, Greeley, Colorado 80631; or send resume to P.O. Box 758 Greeley, Colorado 80632. Continuous recruitment. Apply immediately.

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NATIONWIDE OPPORTUNITIES**

The Technical Services Division of Sperry Univac provides systems design, applications analysis, programming and other software services to a wide range of customers. We continue to grow in technological capabilities and contract commitments. Immediate openings exist in the following locations:

- Albuquerque, New Mexico
- Houston, Texas
- Richland, Washington
- Pasadena, California
- Washington, D.C.

Opportunities are available in the following technical areas:

- DMS 1100 Design and Development
- Business Applications
- Operating Systems Support
- Scientific Software
- Space Shuttle Support

These positions offer significant responsibility and considerable customer contact as well as advanced technological involvement. We are seeking individuals with proficiency in ANY of the following areas:

- DMS 1100, CMS, TIP or QLP
- 1100 FORTRAN
- EXEC 8 Internals
- 1100 COBOL
- 1100 ASSEMBLER

If you have a background in any of the above areas, you can realize the full potential of your training and experience and grow with Sperry Univac while you enjoy an excellent salary and the security of a comprehensive benefits program.

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(703) 558 7230

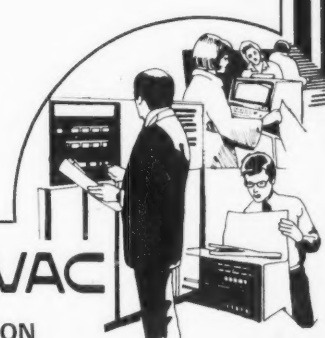
1901 N. Moore Street Arlington, Va. 22209

Merlin Smith
(714) 268 3600

1333 Camino del Rio South
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Anticipated appointment beginning 1 January 1980. Appointee will teach freshman/sophomore level courses in computer science and data processing. A thorough knowledge of FORTRAN, COBOL, BASIC, LISP, and ALGOL is necessary with knowledge of MACRO-10 and BAL desirable. Experience with the DEC-System-10 and mini-systems desirable. Applicant must have at least an MS in Computer Science with doctoral study highly desirable. A minimum of two years teaching experience in computer science/data processing at the university level is required. Industrial and/or research experience desirable but not necessary.

Send all resumes and inquiries to:
Dr. August R. Freda Chairman
Engineering & Computer Science
Univ. of Pittsburgh at Bradford
Bradford, Pa. 16701

Deadline for application is
16 April 1979

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OPPORTUNITIES**

This expanding San Diego bank has opportunities for individuals with COBOL programming and financial background in the following areas:

- SR. ANALYST PROGRAMMER
Requires 2-4 yrs. experience.
- ANALYST PROGRAMMER
Requires 1-2 yrs. experience

Ideal candidates for above positions will have knowledge of BURROUGHS. Experience in data communications, data base and on-line applications desirable.

Competitive salaries and benefits.

Other opportunities also available: Computer Room Supervisor, Burroughs experience.

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& SAVINGS BANK**

Attn: K. Paris
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San Diego CA 92111

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MICHIGAN

A financial holding company located in Central Michigan requires a manager for its banking software systems.

This person must be technically knowledgeable to maintain and develop banking applications on an IBM 370/DOS/VS/CICS computer. Must be proficient in ANS COBOL and have some experience with BAL and on-line banking systems.

The successful candidate will have a complete knowledge of the internal operations of a commercial bank, along with the ability to communicate with the respective user departments.

Qualified candidates should submit a current resume complete with salary history in confidence to:

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PROGRAMMER - PROGRAMMER ANALYSTS

Why not work with the best! Union Planters National Bank is seeking Data Processing talent to add to its staff of computer professionals. Work with the leading Southeast Bank in EFT and POS systems. Fully utilize your expertise by working with our new Amdahl 470 V/7. Cobol or assembler language is required. Experience with OS or VS is preferred, yet DOS experience will be considered. IMS DB/DC experience would be a real plus.

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Union Planters
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SYSTEMS ANALYST/ PROGRAMMER • CALIFORNIA •

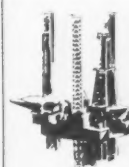
Santa Monica Location

We are a large, acute care facility. We desire a career-oriented person who is ready to assume top to bottom responsibilities for financial and medical applications. These systems will interface with both on-line and batch applications on an NCR Criterion and 256 K Systems.

Prefer NEAT III or COBOL Programming experience. Degree is a plus. Excellent salary and benefits. Please call or send your resume to:

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(213) 829-8945

Equal Opportunity Employer



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Exploration and
Production
Well Mgm't. System
knowledge

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Wouldn't you like to work in a division which has the friendliness of a small company with all the great benefits and advantages of a major company behind it?

- Will direct a project team—no programming
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- Our well management system will consist of production, pressure & other engineering data; revenues, royalties, interests and other financial info plus government reporting.

Need exploration & production well technology & reporting knowledge; know large frame computer capabilities & data base techniques.

Please send resume or letter of interest to: Terry Baldwin

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Exploration & Production Division

Northern Natural Gas Company
Exploration & Production Division
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SYSTEMS ANALYST (Experience in Systems Design)	\$22-25,000
PROGRAMMER ANALYST (Manufacturing terminals)	\$20,000
PROGRAMMER ANALYST (Large scale IBM with COBOL and applications desired)	\$16-18,000
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Data Processing

**SPPS 1
ANALYST**

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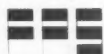
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We are looking for a qualified Systems Programmer to join our staff working with an IBM 370/158 OS V52 with CICS and HASP. You may qualify for this position with 1-3 years of related systems programming experience. Waddell & Reed, Inc. is a financial services company located in Kansas City, Mo. We offer a full benefit package, moving expenses, and an excellent work environment in our Crown Center location.

If you think you may qualify, call or write to:

Bill Howey
Waddell & Reed, Inc.
2400 Pershing Road Box 1343
Kansas City Mo. 64141
816 283-4039
EOE/MF

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Real-Time Project Leader

The candidate we seek is currently a project leader in a sophisticated DP organization. He or she will be experienced in real-time systems design, data base design, and systems analysis, with working knowledge of CICS using COBOL, for IBM 370-138 system or equivalent. We offer the challenge of project responsibility, direct involvement with upper management, and a key role in our real-time systems development strategy. BA or BS or equivalent in computer science, business administration, engineering, or mathematics preferred.

Systems Programmer

We seek an experienced systems programmer for IBM DOS/VS installation. We have CICS, SPM II, and are considering data base software to support on-line development. Systems programmer would have responsibility for technical environment, systems performance, and software programming. BA or BS or equivalent in computer science, business administration, engineering, or mathematics preferred.

Send resume and salary history in confidence to: Holstein Association; Attn: Dir. Office Div.; 1 South Main St.; Brattleboro, VT 05301.

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SENIOR SYSTEMS ANALYST

...Vermont
...Honeywell 66/60 DM-IV
...Minimum 5 Years Experience Including —
Data Base, Communications, and
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Find out how you can put a vanpool to work for you. Write for our vanpooling kit to: Mr. Robert S. Marx, Office of the Secretary, U.S. Department of Transportation, 400 7th Street, S.W., Washington, D.C. 20590.



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Progressive, dynamic, company looking for programmer analyst capable of management opportunities. Educational and/or work experience in finance accounting/management areas of value. Finest fringe package available. Salary \$14,000 - \$18,000 (based on qualifications).

Send a detailed resume and salary history to P.O. Box 300, Southfield, Michigan 48037, Attn: Mr. Cahill.

Computer Science Instructor for Inmate Educational Training Program. Master's Degree with teaching experience and/or work experience in the field preferred. Contact Personnel Office, Joliet Junior College, 1216 Houbolt Avenue, Joliet, Illinois, 60436, (815) 729-9020, Ext. 266.

Equal Opportunity Employer

COMPUTER SCIENCE FACULTY POSITION

An opportunity to have an impact on developing field of Computer Science at a liberal arts college. Westminster seeks a C.S. faculty member to teach introductory/advanced courses and serve as C.S. major advisor. College stresses excellence in teaching; small student-faculty ratio. Normal teaching load, 12 hours per semester. Masters in C.S. required. Rank/salary open, depending on qualifications. Contact: John Schultz, Assistant Dean, Westminster College, Fulton, MO 65251. AA/EOE.

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SOFTWARE Designer: Simulation radar/tracking, Assembler \$30K
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SYSTEM Engr: IMS, CICS, 370 JCL, DL-1, Cobol, TSO \$25K
PROGRAMMER: Real-Time, minis, Fortran, Assembler \$24K
PROJECT Leader: Major Airline Burroughs/IBM Bus. Anal. \$22K
PROGRAM Analyst: H6000 or IBM, Cobol, Banking environment \$21K

Contact:
Technical Recruiting Dept.
C/M of Orlando
3101 Maguire Blvd.
Orlando, Florida 32803
(305) 894-5551

PROGRAMMER ANALYST

A leading Upstate New York retail chain has an immediate opening for a Programmer Analyst.

Knowledge of Assembler language a necessity. The ideal candidate will possess three years experience in 370 or System 3 Assembler. Experience in IBM series 1 a definite asset.

We offer growth potential and salary commensurate with experience.

To investigate this opportunity further, send a resume, in strict confidence, with salary history to:

Naum's
2373 Ridge Rd. West
Rochester, NY 14626
Attn: Personnel Dept.

Computer Analyst to develop automated data processing systems for auxiliary enterprises. Louisiana State University. Senior position requiring masters degree and experience or bachelors degree and extensive, specialized experience. Design, testing and analysis of computer software. Salary competitive. Apply to Ralph Gosard, Student Affairs, Louisiana State University, Baton Rouge, La. 70803, by May 1, 1979. LSU is an equal opportunity employer.

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Professional Personnel Consultants recruiting for several clients in Michigan/Ohio/Georgia/Florida/Texas/Louisiana in the need of RESULTS ORIENTED professionals.

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Southfield, Michigan 48075
(313) 257-4810

UNIVERSITY OF MISSOURI HOSPITALS & CLINICS

COMPUTER CENTER DIRECTOR

The University of Missouri Hospital and Clinics, a 500 bed teaching hospital with 160,000 out-patient visits, is seeking a Director for the 44 member Computer Department. Candidates must have had management responsibility in an administrative-oriented computer installation of significant size. The Director must be oriented more to the planning and management of administrative services than to technical functions. Candidates should communicate effectively and cooperatively in a professional/academic organization. Knowledge of medical care data processing is essential. Candidates should possess a degree in business administration or computer science or a closely related field. Six years experience in supervision of computer systems development and design is necessary.

APPLICATIONS MUST BE RECEIVED BY MAY 10, 1979. Send resume to:

Director
University Hospital & Clinics

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MISSOURI-COLUMBIA**

807 Stadium Road
Columbia, Missouri 65212

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\$33 - \$38,000

+ BONUS

Major Manufacturing Division of Fortune 500 Corporation, located in N.E. Ohio, has immediate opening for Man or Woman to Head up their Data Processing Department. Our client requires emphasis in Manufacturing Systems and strong Managerial experience. Department consists of 3 Supervisors and 25 Support People and Multi Plant capabilities. Women and minority job candidates are encouraged to respond. Submit background information and salary history in complete confidence to:

R.J. EVANS & ASSOCIATES
26949 Chagrin Boulevard
Beachwood, Ohio 44122
Telephone: 216/464-5100

SOFTWARE PROFESSIONAL

A major international electronics company is seeking a senior level software professional to join in the development of state-of-the-art computer peripherals. Technical responsibilities will include interface definition, architectural design, programming, and some operating systems development. In addition, customer contact and occasional travel complement the technical aspects of this position.

The ideal candidate will have 5-9 years experience with mini-computer systems and peripheral software coupled with microcomputer program development, particularly in terminal of display peripherals.

This position is based in the New England Area. We offer a competitive starting salary and an excellent benefits package. All interested candidates should mail resume (including salary history) to:

CW BOX 1865
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Newton, MA 02160

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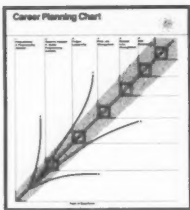
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Wellesley MA	617/237-3120	Denver	303/773-3700
Hartford	203/522-6590	Fort Worth	817/338-9300
New York	212/736-7445	Houston	713/626-8705
Paramus NJ	201/265-7456	New Orleans	504/561-6000
Philadelphia	215/665-1717	San Antonio	512/344-0217
Stamford CT	203/329-8411	West Coast	
Union NJ	201/687-8700	Los Angeles	213/386-5500
Washington DC	703/790-5610	Encino CA	213/995-8866
Midwest		Irvine CA	714/833-1730
Chicago	312/782-0857	Torrance CA	213/540-7500
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Oak Brook IL	312/986-0422	Portland OR	503/223-6160
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Cincinnati	513/769-5080	San Francisco	415/434-2410
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Detroit	313/963-0510	Canada	
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Kansas City MO	816/474-3393		
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Minneapolis	612/544-3640		
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If unable to call, write:
Source Edp, Department CA
721 Enterprise Drive
Oak Brook, IL 60521
(When writing, please be sure to use home address and indicate position title)

MAS MANAGER

Career opportunity with progressive regional CPA firm. Experienced in mini-computer selection and implementation (1-3 years). Experience with Big 8 or other CPA firm preferred.

Send resume and salary requirements to C.E. Keller, III, Stoy, Malone & Company, 7315 Wisc. Ave., Bethesda, MD 20014

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Progressive data processing oriented bank in a mid sized, family oriented, Indiana community is seeking growth oriented Programmer/Analyst. Candidate must have minimum of two years COBOL programming experience. Prefer an individual with Burroughs Medium Systems experience, bank experience or Computer Science Degree. Full range of benefits. Salary commensurate with experience. Mail resume to attention of Personnel Department, The First National Bank, 630 Promenade, Richmond, Indiana 47374 or call 317-935-1111. An Equal Opportunity Employer M/F.

EDP Audit Openings

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Mgr New Mfg EDP/Aud exp	\$35
Sr Energy Sys/Aud exp	\$25
Mgr New Mfg no travel	\$25
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Sr Mfg EDP/Aud exp	\$28
1-2 yrs exp acctg	\$25
Sr Bk EDP/Aud exp COBOL	\$25
Mgr New Mfg EDP/Aud exp	\$32
Mgr New Minis	\$30
Dir New Retail 3-5 yr	\$38
Mgr Mfg high visibility	\$38
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Supv Ins Acctg/Sys	\$32
Mgr Mfg 2yrs Aud exp	\$30
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Entry Bk no exp req	\$15
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Sr Bk Sys/Prog exp	\$26
Supv new-small town	\$26
Supv Eng. EDP/Aud ex	\$32
Sr Energy 50%T	\$25
Mgr Energy Fortune 50	\$40
Consult Bk 8 Bonus	\$30

WEST COAST

Security Adm Mfg	\$30
Mgr New Mfg visibility	\$42
Mgr Mfg IBM no travel	\$35
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Audit operating software	\$30
EDP Aud mfg small town	\$25
Sr Bk EDP/Aud exp	\$32

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Sr Energy 25%T Tex	\$23
Sr Mfg CPA 30%T Cal	\$30
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Entry Mfg NE	\$12-\$18
Sr Control Aud NYC	\$35
Int Aud 12-18 mo promote	\$24
Gen Aud Bank SW	\$28
All levels Mfg	\$18-\$32
Sr Energy 25%T Tex	\$26
Sr Mfg 30%T III	\$28
Supv Bk Tex	\$28
Sr Bk 5%T Tex	\$28
Lead Bk 20%T Tex	\$22
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(405) 843-9593

ACADEMIC COMPUTING MANAGER

PEPPERDINE UNIV. MALIBU, CALIFORNIA

Pepperdine University is seeking a manager for its research and instructional computing activities. Applicants should have knowledge of computer use in diverse disciplines, ability to communicate with faculty and students (including doctoral level graduate students), knowledge of statistics and research methods, and management ability. Extensive previous work experience with computing in an academic environment and an earned doctorate are highly desirable. Salary is commensurate with academic background and experience up to \$31,000 annually. Pepperdine is a Christian-oriented university and an Equal Opportunity Employer. Send resume postmarked no later than April 13th to Search Coordinator, Academic Computing Manager, UIS, Pepperdine University, Malibu, CA 90265 (213) 456-4173.

TECH SUPPORT

Interactive Small Business Systems

Distributor division of interactive small business systems manufacturer has engaged us to conduct a search for a manager of technical support. We seek a candidate with experience in systems and applications software with substantial RPG 11 background, BASIC would be a plus. Manufacturing systems experience is very desirable. Installation and customer interface will be an important part of this position.

The successful candidate will be qualified and capable of building and managing a support staff. Reporting to the director, aggressiveness, self-motivation and the ability to develop and run a business plan will be key qualities. Prefer Greater Boston applicant.

Please call or send resume to Richard E. Aubin.

George D. Sandel Associates

Executive Search Consultants
(617) 890-0713 479 Winter Street
Waltham, Massachusetts 02154

Our client is an equal opportunity M/F Employer

HELP!!!

One of our top clients with data centers in Florida and Colorado seeks Programmers, Programmer/Analysts and Systems Analysts to function as consultants to their national and international clients. The following are mandatory requirements:

- 1) ANS COBOL
- 2) MANUFACTURING EXPERIENCE IN AN IBM ENVIRONMENT
- 3) WILLING TO TRAVEL EXTENSIVELY

The company pays all fees, including interviewing and relocation, additionally, they offer excellent benefits, in-house career progression and salaries in the \$15-27K range. Please call me collect (904) 398-7371 if you are interested in this excellent opportunity.

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Jim King and Associates

438 Gulf Life Tower/Jacksonville, Florida 32207
(904) 398-7371

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We need help with generating and tuning IMS-DC, CICS and VTAM systems.

You get 26K+ to start, depending on your experience and education, plus a comprehensive benefits package. In addition, you get the benefits of living in a small city. Topeka has excellent schools, pollution-free, safe streets, with boating, hunting, fishing, and camping facilities close by. Tired of commuting? Forget it! Topeka's suburbs are only four miles from downtown. But when you want a taste of big city life, sixty miles down I-70 is Kansas City.

Your future will be tied to ours and we're planning on 3033's starting in August. 8100's (14 on order) and 4330's when we can get them.

To apply, mail your resume, academic transcript and salary requirements to:



L. D. Rodriguez
Manager Personnel Development
The Atchison, Topeka, & Santa Fe Ry. Co.
80 E. Jackson Blvd.
Chicago, IL 60604

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SENIOR PROGRAMMER

In one of the most desirable areas of the United States, we have an immediate opening for a SENIOR PROGRAMMER/ANALYST with our progressive national manufacturing company. Applicant should have minimum of two years RPG II with manufacturing experience. CCP experience helpful. S/3 Model 15D configurations. Excellent company benefits; salary commensurate with experience. Contact Personnel Manager, Phifer Wire Products, Inc., P.O. Box 1700, Tuscaloosa, Alabama 35403. Call toll free 1/800 633 5955. An equal opportunity employer.

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Computer Professionals



Deere & Company, a leading manufacturer of agricultural equipment, has openings for the following positions:

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You must have a minimum of 2 years experience, including IMS, in an IBM environment, preferably in manufacturing areas. Responsibilities will be varied.

PROGRAMMERS

Prefer a minimum of 2 years experience including IMS with IBM equipment plus a knowledge of one or more of the following languages: COBOL, PL1, and FORTRAN.

We offer qualified candidates excellent starting salaries and comprehensive company-paid benefits including paid relocation to Iowa. For consideration, direct your inquiry with salary history to:

Ronald H. Like
Deere & Company
Moline, Illinois 61265

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CAREER OPPORTUNITY IN DENVER

Auto-Trol Technology Corporation is the World Leader in the Manufacture of Computer Graphic Systems.

We design and market the AD/380 Automated Design and Drafting System,* a refined combination of hardware and software that facilitates all standard drafting functions and engineering designs.

It is used in piping, civil, mechanical, architectural and structural engineering, printed circuit designs and more. Our system includes: A central processing computer, digitizer for electronic tracing, CRT graphic input stations, plotters for final drawing reproduction, and other interactive peripherals. Continued market expansion has created the following position in our Denver headquarters.

PROGRAMMER ANALYST

Need qualified applicant to analyze user requirements and write and test programs and assist with user training. Requires 4 to 6 years programming experience and bachelor of science degree in data processing math or scientific disciplines.

Our company is twenty years old with sales and service offices throughout North America and overseas.

This position offers excellent starting salary, liberal benefits package including relocation reimbursement, profit sharing, and advancement opportunity.

Qualified candidate send complete resume with salary history in confidence to: MR. JOHN LOVEJOY.



Auto-trol Technology Corporation
5650 N. Pecos St., Denver, Colo. 80221
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A DIVISION OF HUBLEIN IS SEEKING THE FOLLOWING CANDIDATES:

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Involving Financial and Marketing Applications. New POS System.

- In depth knowledge of COBOL programming language required.
- Familiarity with IBM 370-138 DOS Operating System.
- 3 years experience.
- College Degree preferred.

SENIOR PROGRAMMER ANALYST

- 4-6 years experience
- College degree preferred.
- Knowledge of basic accounting and business principles and computer applications thereof.

PROJECT MANAGER

- 6 - 10 years experience.
- College degree with business or accounting major preferred.
- Knowledge of several programming languages, especially COBOL.
- Knowledge of available computer system techniques to solve general business problems.
- Knowledge of computer industry trends in relation to latest hardware and software.

We offer a competitive salary, excellent benefits and career opportunity. Send resume and salary history in confidence to:

Supervisor of Staffing
P.O. Box 32070
Louisville, Ky. 40232

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Just as your career success is based on professional knowledge and hard work, we at E.P. Reardon have built a tradition of success on these same factors. For over fifteen years, we have been successfully servicing major high-technology companies throughout New England, placing computer professionals in very promising positions. We have become the most well-known and respected professional placement organization in the area.

Regardless of your field of specialization—systems or applications, programming or analysis—or your level of experience—entry level through senior management—your large mainframe, minicomputer or microprocessor experience can create exciting new opportunities for success.

To get the confidential, reliable service you need to make your career change in New England or throughout the entire country, phone collect or write Dan Meagher or Charles Bower at E.P. Reardon, you'll get results. Because it's our business to make you a success.

Client companies assume all fees.



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SYSTEMS ANALYST

Position available with rapidly expanding company located in lovely Willamette Valley. Profit sharing, fully paid insurance and dental plan, stock option plan and room for advancement. Applicant must have:

- Experience in design implementation, operation of real-time or control systems
- Assembly language programming
- Field experience with industrial customers

Send resume and salary requirements to:

Francine Counihan
Personnel Supervisor
Applied Theory Assoc.
150 NW Lewisburg Rd.
Corvallis, OR 97330

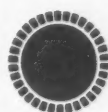
AIRLINES EDP

If you have experience working for a major airline, or have Fortran or Univac, or PARS/ACP, or large IBM mainframe background, this may be your opportunity. Variety of applications development opportunities available with major clients. Salary range \$18,000 to \$26,000. Openings in major cities including Minneapolis-St. Paul. Please rush your resume, with salary history and geographical preference to:

T.G. Barrett, President.



Data Processing
Recruiters
322 Grosvenor Ave.
Minneapolis, MN 55403
(612) 871-9144



AMERICAN
BANKERS
INSURANCE GROUP

SYSTEMS PROFESSIONALS

Due to a major expansion in system development, we have an immediate need for the following positions:

PROGRAMMER ANALYST

Minimum of 2 years experience using COBOL under DOS/VS. Experience within an insurance or banking environment would be helpful.

SYSTEM ANALYST

Minimum of 2 years experience specializing in manual systems development, with knowledge of computer systems. Responsibilities will include the designing of paper flow, writing procedure manuals, and training user personnel.

These positions will develop a major system to be used in support of the company's financial marketing division. Limited travel will be involved. We are currently operating with twin IBM 370/148's. We offer an excellent compensation program, relocation, in-house training facility for career development, and excellent benefits. For immediate consideration, please send a letter or resume to:

Richard M. Reynard

AMERICAN BANKERS
INSURANCE GROUP

Human Resources Department
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Responsibilities will include coverage of our CPU installed bases with openings available in the following areas: Atlanta, Chicago, Dallas, Boston, Long Island, North New Jersey, Detroit, Los Angeles, New York City, San Francisco, and Washington, D.C., providing Magnuson Systems customers with hardware and software support.

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We offer ground floor growth opportunity, and our compensation and benefit package includes company paid medical, dental, hospitalization, life insurance and free prescription drugs. Our salaries are very competitive and include a STOCK GRANT PLAN.

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Magnuson

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SENIOR SOFTWARE DESIGNERS

American Science and Engineering has outstanding opportunities to join our team of software specialists in exciting new development work for a major communications product using electric power lines as the communications medium. The project involves: real time scheduling, data base organization, language processing, multiple processor support and the writing of our own operating system for one of the processors. We are using FORTRAN 5 and Assembler language for Data General's Eclipse line of computers. There will be opportunities for customer contact and travel.

The atmosphere at AS&E is distinctive in its successful blend of informality and superb standards. Our Cambridge, Massachusetts location provides benefits which range from the leading universities available for professional association, to the rich cultural resources of the city of Boston. We have openings at all levels of this project.

Send resume or call
Lee Binnig at American
Science and Engineering,
Inc., 955 Massachusetts
Avenue, Cambridge,
Massachusetts 02139
(617) 868-1600

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AS&E

Eastern Montana College

Computer Programmer II, Grade 13, \$6,705/hr. Computer Center. Able to perform programming duties relative to the development, implementation, and maintenance or conversion of on-line instructional systems primarily for Academic Services Unit. Math background with 1 or 2 yrs. of solid FORTRAN programming exp. & ability to consult with academic community & offer instructional aid req. Academic computing exp. & know. of time-sharing hardware and software desirable. Deadline 5/1/79. Send letter of application and resume to Jack C. Hall, Director, Computer Center, Eastern Montana College, Billings, Montana 59101, 657-2235. An Equal Opportunity/Affirmative Action Employer.

PROGRAMMER/ANALYST

ARE YOU SEARCHING FOR A CAREER IN DATA PROCESSING WITH A DIVISION OF A FORTUNE 100 CORPORATION? WOULD YOU LIKE TO WORK AT THE WORLD HEADQUARTERS OF THE WORLD'S LARGEST MANUFACTURER OF HYDRAULIC COMPONENTS? THEN SPERRY VICKERS IS THE PLACE FOR YOU IF YOU QUALIFY FOR THE FOLLOWING POSITIONS:

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- Positions require two years of college plus specialized courses in computer programming and related data processing course work, and 1-3 years COBOL programming experience on financial, payroll, or personnel applications on large scale computers using data base and on-line processing.

SOFTWARE PROGRAMMER

- Applicants must have equivalent of a Bachelors Degree in Computer Science or Mathematics, be thoroughly proficient in the use of the 1100 Assembler, have a good understanding of the Executives, and working knowledge of higher level languages.

SENIOR SYSTEM ANALYST

- Candidate should have the equivalent of Bachelors Degree in Business Administration or Computer Science. An MBA with post-graduate courses in Information Sciences or Operations Research is preferred.

This position requires 3-6 years systems development experience on large scale computers using data-base and on-line processing in order entry or materials control. Responsibilities include analyzing systems requirements, development of detailed system specification, and guiding programmers and systems analysts on a project basis.

Sperry Vickers offers tremendous potential for professional growth and excellent salaries and fringe benefits. For prompt, confidential consideration, please forward your resume including salary history to:

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1401 Crooks Road
Troy, MI 48064

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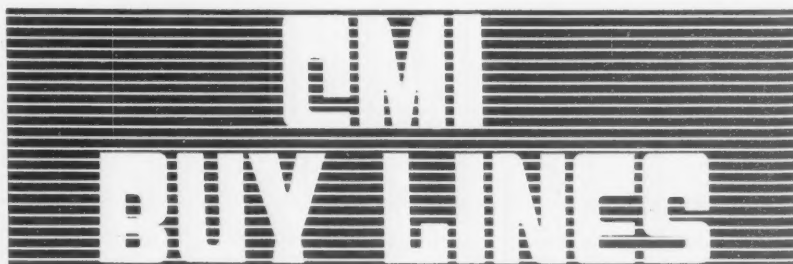
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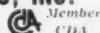
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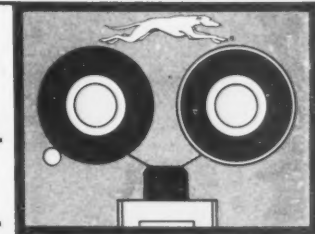
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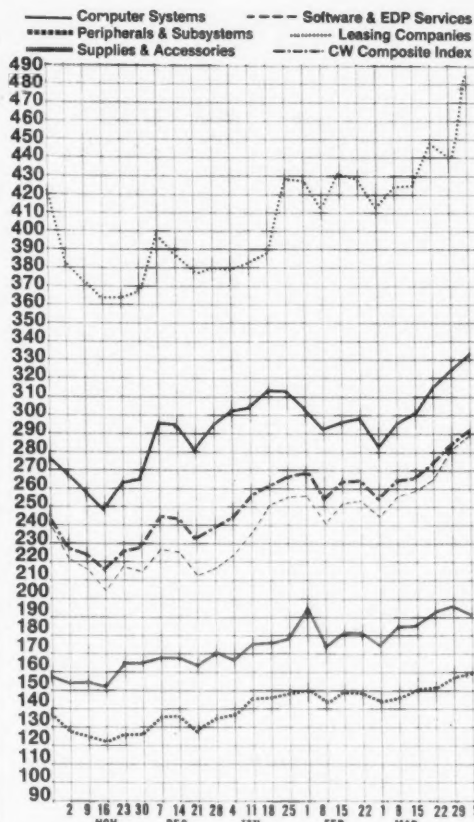
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Cambridge, Mass. 02139



APPLIED DEVICES			
Three Months Ended Jan. 31			
	1979	1978	
Shr Emd	\$.17	\$.14	
Revenue	17,312,000	7,384,000	
Earnings	750,000	572,000	

DATA DIMENSIONS			
Year Ended Dec. 31			
	1978	1977	
Shr Emd	\$.80	\$.24	
Revenue	15,707,000	11,870,000	
Earnings	853,000	183,000	
3 Mo Shr	10	58	
Revenue	4,098,000	4,003,000	
Earnings	103,000	(137,000)	

DOCUMENTATION			
Year Ended Feb. 2			
	1979	1978	
Shr Emd	\$2.11	\$1.22	
Revenue	59,721,000	31,555,000	
Earnings	6,358,000	3,657,000	
3 Mo Shr	15,752,000	8,176,000	
Revenue	1,780,000	1,309,000	

a-For 53 and 13 weeks.

EMM			
Year Ended Dec. 31			
	1978	1977	
Shr Emd	\$.88	\$.68	
Revenue	130,918,000	108,944,000	
Earnings	55,799,000	4,706,000	
3 Mo Shr	35,124,000	28,284,000	
Revenue	269,000	1,308,000	

a-Restated. b-Includes gain on investments of \$2,974,000.

MICRODATA			
Three Months Ended Feb. 28			
	1979	1978	
Shr Emd	\$.70	\$.44	
Revenue	24,172,000	15,992,000	
Earnings	1,591,000	980,000	
3 Mo Shr	1,300	72	
Revenue	44,618,000	25,406,000	
Earnings	2,944,000	1,820,000	

Computerworld Stock Trading Summary

CLOSING PRICES TUESDAY, APRIL 3, 1979

E X C H		1978-79 RANGE (1)	PRICE		WEEK NET CHNGE	WEEK PCT CHNGE
			CLOSE APR 3 1979	APR 2 1979		
	COMPUTER SYSTEMS					
A	AMOHL CORP	28-69	40 3/8	+1 1/2	+3.8	
N	BARRIUGH'S CORP	59-87	72	+5/8	+0.8	
O	COMPUTER AUTOMATION	15-44	17 1/4	+1 3/4	+11.2	
N	CONTROL DATA CORP	23-44	34 1/2	+5/8	+1.8	
O	CRAY RESEARCH INC	8-33	28 1/2	+2 1/2	+9.6	
N	DATA GENERAL CORP	42-71	70 5/8	+1 3/8	+1.9	
N	DATAPoint CORP	34-82	80	-1/4	-0.3	
N	DIGITAL EQUIPMENT	39-58	55 3/8	+1/8	+0.2	
N	ELECTRONIC ASSOC.	2-13	8 7/8	+1/8	+1.8	
A	ELECTRONIC ENGINEER	9-19	11	+1/8	+1.1	
N	FOUR-PHASE SYSTEMS	19-46	35 1/2	-3/4	-2.0	
N	FOXBORO	28-40	33	+1/2	+1.5	
O	GENERAL AUTOMATION	7-26	16 1/2	+1 3/4	+11.8	
O	GRI COMPUTER CORP	1-3	1 7/8	-1/8	-6.2	
N	HENLETT-PACKARD CO	62-96	96 1/4	+5/8	+0.6	
N	HONEYWELL INC	43-76	68 1/2	+1/2	+0.7	
N	IBM	236-321	319 1/2	+1 3/4	+0.5	
O	MANAGEMENT ASSIST	9-25	25	+1	+6.1	
O	MANUFACTURING DATA S	9-25	25 1/4	+1 3/8	+5.7	
O	MICRODATA CORP	10-23	22 1/4	-3/8	-1.6	
O	MINI-COMPUTER SVST	4-8	5 1/4	+1/2	+10.5	
O	MODULAR COMPUTER SVS	7-18	17	+1 1/2	+9.6	
N	NCR	37-72	70 1/4	-1 1/4	-1.7	
N	PRIME COMPUTER INC	20-43	38 5/8	+3 5/8	+10.3	
N	PERKINS-ELMER	17-33	33 1/4	+5/8	+1.9	
N	SPERRY RAND	33-51	50 1/2	+1 3/8	+2.7	
A	SYSTEMS ENG. LABS	11-24	16 1/2	-1/4	-1.4	
O	TANDEN COMPUTERS INC	13-37	31 1/2	+1 3/4	+5.8	
A	WANG LABS.	12-43	41 5/8	-1	-2.3	
	LEASING COMPANIES					
C	BOOTH COURIER CORP	13-21	18	-1/4	-1.3	
C	COMDISCO INC	3-21	20 3/4	+2 3/4	+15.2	
A	COMMERCE GROUP CORP	1-1	1 1/2	+1/4	+100.0	
A	COMPUTER INVESTS GRP	1-7	3 1/4	-1/8	-3.7	
C	CONTINENTAL INFO SVS	5-15	8 1/2	0	0.0	
M	DATRONIC RENTAL	1-3	3	0	0.0	
A	DCL INC	3-5	4 3/8	+1/8	+2.9	
N	DPF INC	8-14	11 3/4	+1/8	+1.0	
N	ITEL	18-38	22	-1/2	-2.2	
N	LEASCO CORP	24-42	42	+2 1/8	+5.3	
O	LEASPCORP CORP	1-8	1 3/4	0	0.0	
A	PIONEER TEX CORP	3-7	3 5/8	+3/8	+11.5	
N	U.S. LEASING	13-20	15	+1/8	+0.8	

E X C H		PRICE			
		1978-79	CLOSE	WEEK	WEEK
		RANGE (1)	APR 3 1979	NET CHNGE	PCT CHNGE
SOFTWARE & EDP SERVICES					
O	ADVANCED COMP TECH	1-2	7/8	0	0.0
O	ANACOMP INC	8-22	18 1/4	+7/8	+5.0
A	APPLIED DATA RES.	8-17	11 3/4	+1/4	+2.1
N	AUTOMATIC DATA PROC	24-36	31	0	0.0
O	COLERAN AMERICAN COS	1-2	5/8	0	0.0
O	COMPU-SERV NETWORK	5-12	9 1/2	+3/4	+8.5
O	COMPUTER HORIZONS	1-9	5 1/4	+1/4	+5.0
O	COMPUTER NETWORK	5-16	7 7/8	+7/8	+12.5
O	COMPUTER SCIENCES	8-17	13 1/4	+3/4	+6.0
O	COMPUTER TASK GROUP	1-5	5	+1/4	+5.2
O	COMPUTER USAGE	2-4	2 7/8	0	0.0
O	COMPUT AUTO REP SVC	4-10	8 5/8	0	0.0
O	COMSHARE	6-24	24	+2	+9.0
O	CULLINANE CORP	14-33	22 1/4	-1/2	-2.1
O	DATA DIMENSIONS INC	4-9	5 3/8	-1/8	-2.2
O	DATATAB	1-4	3 1/4	0	0.0
N	ELECTRONIC DATA SYS.	15-25	18 7/8	-3/4	-3.8
O	INSYTE CORP	1-3	1 1/8	0	0.0
O	IPS COMPUTER MARKET	2-3	3	0	0.0
O	KEANE ASSOCIATES	3-6	6	+1/4	+4.3
O	KEYDATA CORP	1-4	4	+1	+33.3
A	LOGICON	10-19	14	+1/4	+1.8
A	NATIONAL CSS INC	15-46	45 3/4	+1/8	+0.2
O	NATIONAL DATA CORP	7-13	11 3/8	+5/8	+5.8
A	ON LINE SYSTEMS INC	12-30	21 3/4	0	0.0
N	PLANNING RESEARCH	4-10	6 1/8	+1/4	+4.2
O	PROGRAMMING & SYS	1-1	1	0	0.0
O	RAPIDATA INC	3-7	5 5/8	-1/4	-4.2
O	REYNOLDS & REYNOLD	18-36	29 3/4	-1/2	-1.6
O	SCIENTIFIC COMPUTERS	3-9	6 1/2	-1/4	-3.7
O	TYMSHARE INC	18-41	37 1/4	+7/8	+2.4
A	URS SYSTEMS	5-8	5 7/8	-1/4	-4.0
N	WYLY CORP	1-7	5 1/2	0	0.0
PERIPHERALS & SUBSYSTEMS					
N	ADDRESSOGRAPH-MULT	14-32	18 7/8	-1 1/4	-6.2
N	AMPEX CORP	10-19	16	-1/4	-1.5
O	ANDERSON JACOBSON	5-10	7 3/4	+1/8	+1.5
N	APPLIED DIG DATA SYS	9-22	10 1/8	+1/4	+2.5
O	BEEHIVE INT'L	3-7	4 3/8	+1/8	+2.9
A	BULK/BERANEK & NEW	6-14	12 1/8	+1/8	+1.0
N	BUNKER-RAND	10-22	21 7/8	+1/2	+2.3
A	CALCOMP	3-13	10	-1/8	-1.2
O	CAMBRIDGE MEMORIES	3-9	3 1/4	+1/4	+8.3
N	CENTRONICS DATA COMP	10-40	38 1/8	-1 5/8	-4.0
O	COGNITRONICS	1-4	1 3/4	+1/8	+7.6
O	COMPUTER COMMUN.	6-10	8 5/8	-1/4	-2.8
O	COMPUTER CONSOLES	4-11	9 1/2	-1/2	-5.0
A	COMPUTER EQUIPMENT	3-6	5	+1/8	+2.5
O	COMPUTERVISION CORP	9-48	45 1/4	-1/4	-0.5
O	CONTECH	9-38	24 1/2	-1/4	-1.0
A	CONRAC CORP	13-26	17 7/8	+2 1/4	+14.3

E X C H	1978-79 RANGE (1)	PRICE		WEEK NET CHANGE	WEEK PCT CHANGE
		CLOSE APR 3 1979	APR 2 1979		
SUPPLIES & ACCESSORIES					
O DATA ACCESS SYSTEMS	3-14	9 1/4	+ 1/4	+2.7	
A DATA PRODUCTS CORP	14-25	18 3/4	+ 3/4	+4.1	
O DATUM INC	2-6	2 5/8	- 1/8	-4.5	
O DECISION DATA COMPUT	2-6	4 3/8	+ 3/8	+9.3	
O DELTA DATA SYSTEMS	1-1	1/8		0.0	
A DOCUMENTATION INC	6-34	21 7/8	- 5/8	-2.7	
O DATARAM CORP	6-32	18 1/2	+ 1/2	+2.7	
N ELECTRONIC M & M	4-9	4 3/8		0.0	
O FABRE-TEK	1-2	3/4		0.0	
O GENERAL COMPUTER SYS	1-3	2 1/2	+ 1/8	+5.2	
O GENERAL DATACOMM IND	9-21	17 1/2	+ 3/4	+4.4	
N HAZELTINE CORP	10-17	15	- 1/4	-1.6	
N HARRIS CORP	17-36	27 3/8	- 3/8	-1.3	
O INFODREX INC	6-11	8 3/8	- 3/8	-4.2	
O INFORMATION INTL INC	7-12	11 3/4	+ 1/4	+2.1	
O INFOTON	1-3	3 3/4		0.0	
O INTEL CORP	39-65	64		0.0	
O INTERSIL	7-18	13 5/8	+1 3/8	+11.2	
A LUNDY ELECTRONICS	4-8	4 7/8	- 1/2	-9.3	
O MSI DATA CORP	10-19	10 1/2	+ 3/8	+3.7	
N MEMOREX	27-59	35 3/8	+ 7/8	+2.5	
N MOHAMM DATA SCI	6-15	12 1/8	+ 3/8	+3.1	
O UMEX	2-6	8	+ 1/2	+6.6	
O PARADYNE CORP	9-18	18 1/4	+2 1/4	+14.0	
O PENNELL CORP	5-12	10 7/8	+ 1/4	+2.3	
N PERTEC CORP	9-17	9 1/2	- 1/8	-1.2	
A POTTER INSTRUMENT	2-2	1 3/4		0.0	
O RECOGNITION EQUIP	7-13	8 5/8		0.0	
O SCAN DATA	1-5	2 1/2	- 1/2	-2.3	
N STORAGE TECHNOLOGY	19-46	38 3/4	+ 1/2	+1.3	
O T BAR INC	11-22	21 1/2	+2 1/4	+11.6	
O TALLY CORP.	4-14	11 1/2		0.0	
A TEC INC	6-13	6 1/8		0.0	
N TEKTRONIX INC	33-57	54 1/2	- 1/2	-0.9	
N TELEX	3-9	5 3/4		0.0	
O TESDATA SYSTEMS CP	9-23	14 3/4		0.0	
O WILTEK INC	1-2	3/4		0.0	
SUPPLIES & ACCESSORIES					
A AMERICAN BUS PROD	6-11	9 3/4	+ 1/4	+2.6	
O BALTIMORE BUS FORMS	1-4	1	- 1/2	-33.3	
N BARRY WRIGHT	14-34	15 1/2	- 1/4	-1.5	
O CYBERMATICS INC	1-1	3/4		0.0	
O DUPLEX PRODUCTS INC	13-30	19 1/2	+ 1/2	+2.0	
N ENNIS BUS FORMS	8-13	18	+ 3/4	+2.8	

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